306.8
Am3

LIBRARY
RECEIVED
FEB 13 1937

AMERICAN
DYESTUFF REPORTER
DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
BLEACHING ♦ DYEING ♦ FINISHING ♦ PRINTING

VOLUME 26 | FEBRUARY 8, 1937 | NUMBER 3

PONTACHROME* BLACK P2B

This latest addition to the range of Du Pont chrome colors for wool yields bright, greenish shades of black. It is particularly suitable for use as a self-shade on wool in various stages of manufacture, such as loose wool, slubbing, yarn and piece-goods. The resultant dyeings will not only be fast to scouring, light and water, but also to milling.

PONTACHROME Black P2B possesses good all-around dyeing properties and may be applied either in an open kettle or dyeing apparatus. It dyes levelly, shows good penetration and exhausts satisfactorily. This product has also excellent general fastness properties and is noticeably resistant to severe fulling.

The most consistent results are obtained when dyed top-chrome.

*REG. U.S. PAT. OFF.

DU PONT DYESTUFFS
REG. U.S. PAT. OFF.

E. I. DU PONT DE NEMOURS & COMPANY, INC.
ORGANIC CHEMICALS DEPT. DYESTUFFS DIVISION
Wilmington, Delaware

OFFICIAL PUBLICATION OF THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

PACK-UP *your* TROUBLES
HAVE MORE TIME TO PLAY

• NEW HAMPSHIRE •

Photo by Winston H. Pote.

• • WAPACO PRODUCTS *will show you the way!*

It is winter play-time now in the beautiful hills of New Hampshire. One day spent in the out-of-doors enjoying your favorite sport will pay good dividends in health.

With WAPACO PRODUCTS in your plant your mind will be trouble-free and you can enjoy those things that make life worth living.

SPECIAL DETERGENT

A new processing problem has been created by the introduction of rayon in mixtures for woolen fabrics. This is an added material that is difficult to remove. Regular scouring methods are not usually successful, and because of this, the Watson-Park Company has developed a special detergent to meet the particular requirement.

SPECIAL DETERGENT may be added either to the fulling soap or used in the washer.

WATSON-PARK COMPANY

PROVIDENCE, R. I. TEL: HOPKINS 3022 • TORONTO, CANADA. TEL: MELROSE 3807

Main Office:
261 Franklin Street
Boston, Mass.

New England Agents
for
Bates Chemical Co.
Certified Food Colors

Factory:
Lowell Junction
Mass.

Sole Textile Distributors for
COWLES DETERGENT COMPANY, CLEVELAND, OHIO

American Dyestuff Reporter, Vol. 26, No. 3, February 8, 1937. Published every other Monday. Copyrighted, 1937, by Howes Publishing Co., 440 4th Ave., New York, N. Y. Domestic subscription, $5.00; Canadian, $6.00; foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

A. P. HOWES
Publisher

M. D. REESER
Advertising Manager

AMERICAN DYESTUFF REPORTER

LOUIS A. OLNEY
Directing Editor

NORMAN A. JOHNSON
Managing Editor

Copyrighted 1937 by Howes Publishing Co.

DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
• BLEACHING • DYEING • FINISHING • PRINTING •
AND THE NECESSARY MECHANICAL EQUIPMENT

"Circulated Everywhere Textiles Are Processed"

Subscription Price: $5.00 per year; Canadian, $6.80; Foreign, $6.00. Fifty cents per copy

VOLUME 26 | FEBRUARY 8, 1937 | NUMBER 3

CONTENTS OF THIS ISSUE

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

General

Desorption of Substantive Dyestuffs..... 55
A. M. Patel
Washington News Letter..... 58
Waldon Fawcett
Technical Notes from Foreign Sources..... 81
Corrections Re "The Measurement of the Color of Dyed Textiles"..... 82
Trade Notes—New Products..... 82

Proceedings of
American Association of Textile Chemists and Colorists

Sixteenth Annual Meeting:
Annual Business Meeting..... P59
Saturday Morning Session:
The Evaluation of Chemical Tendering of Cellulose by Cellulose Viscosity Measurement... P62
F. H. Guernsey and L. T. Howells
The Applicability of Spectrophotometry to the Solution of Color Problems in the Textile Industry..... P67
Arthur C. Hardy
Saturday Afternoon Session:
The Suitability of Stainless Steel Compared with Other Metals in Bleaching..... P71
Joseph E. Goodavage
Meeting, Philadelphia Section..... P77
Meeting, Northern New England Section..... P77
Applicants for Membership..... P77
Calendar of Coming Events..... P78

Editorial:

More on Getting Along with People—VI..... 79

Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable ways research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

Published Every Other Monday

HOWES PUBLISHING CO. ~ ~ 440 FOURTH AVE. ~ ~ NEW YORK

CLOSING DATE FOR ADVERTISING COPY . . . . . MONDAY PRECEDING ISSUANCE DATE

NATIONAL CARBANTHRENE

PRINTING POWDERS

(Instantly Dispersable)

BRILLIANT · UNIFORM · FAST

For unequaled penetration, sharper prints and better color value in fine lines, scroll work and stipple effects use NATIONAL (Instantly Dispersable) CARBANTHRENE PRINTING POWDERS, the vat color types that remain unchanged in storage thus assuring consistent uniformity on repeats.

NATIONAL ANILINE & CHEMICAL COMPANY, Inc.
40 RECTOR STREET **NEW YORK, N. Y.**

BOSTON	150 Causeway St.	CHARLOTTE	201-203 W. First St.
PROVIDENCE	15 Westminster St.	GREENSBORO	Jefferson Standard Bldg.
CHICAGO	357 W. Erie St.	ATLANTA	140 Peachtree St.
PHILADELPHIA	200-204 S. Front St.	CHATTANOOGA	James Bldg.
SAN FRANCISCO	517 Howard St.	PORTLAND, ORE.	646 N. Thompson St.

TOROTO 137-145 Wellington St. West

Branches and Distributors throughout the World

NATIONAL N DYES

AMERICAN
DYESTUFF REPORTER

VOLUME 26 FEBRUARY 8, 1937 NUMBER 3

Desorption of Substantive Dyestuffs

A. M. PATEL

AMONG all the synthetic dyestuffs which are used for dyeing textile fibers, the substantive cotton colors require very little skill and manual labor in dyeing. However, it is an unfortunate fact that this obvious advantage is more than counter-balanced by the ease with which most of them are washed out when treated with water or a dilute soap solution. It seems that the properties of solubility and the poor fastness to washing are interdependent. The solubility of the substantive colors is directly connected with the number of the sulfonic acid radicals which the dye molecule contains. Dyestuffs belonging to other groups which are found to be fast to washing are generally insoluble in water and are fixed in the fiber by indirect methods which consist in converting them on the fiber into their insoluble form.

Apart from the general knowledge that direct dyestuffs are poor to washing, very little quantitative work seems to have been done on this subject. Recently, W. Weltzien and K. Schulze (Kolloidzeits, *46,* 1933) carried out some experiments on the washing out processes in water free from electrolytes at 70° C. They showed that most of the dye comes out after a short time of washing, but that the addition of electrolytes to water retards it. C. E. Mullin and Macormae (Melliand Textilberichte, *915,* No. 6, 1, 1929) studied the effect of the variation of pH of the water used in rinsing cotton dyed with direct and basic dyes and the amount of the dye removed by rinsing. They came to the conclusion that a rough control of the pH of water was desirable in rinsing the dyed fabrics.

METHODS OF DESORPTION

Two methods of stripping the dyed material have been used in this work. A number of regenerated cellulose discs were dyed to equilibrium according to the method described by Neale and Patel (Trans. Foraday Soc., *30,* 905, 1934) in a bath containing .05 g/l dye and 5.0 g/l sodium chloride or its equivalent of any other electrolyte. In those cases where the desorption is carried out to its final stage, the following method was used.

About 15-20 dyed pieces of cellulose strung together on a silver wire at short intervals were suspended at a time in boiling distilled water contained in a 1000 cc. round-bottom Jena glass flask. At definite periods of time, some pieces were rapidly removed from the silver wire, dried between filter papers and placed in the bottles for stripping off the remaining color by a definite amount of 25.0 per cent aqueous pyridin. In order to avoid back-dyeing, the stripping vessel was changed as soon as it became appreciably colored.

In those cases where the amount of the dye removed in ten minutes was estimated colorimetrically, the following method of stripping was used. The cellulose pieces were dyed to equilibrium at 90° C. in a water-thermostat using a dye-bath which contained in all cases 0.05 g/l dye and 5.0 g/l sodium chloride. A wide Jena glass tube was suspended through a hole in the lid of the rectangular copper vessel used as a thermostat. The stripping tube contained 200 cc. of distilled water. When the temperature of the water in the tube reached 90° C., three to four dyed pieces were suspended in it through a silver wire for ten minutes. At the end of the period, they were quickly removed, dried as usual, stripped with 25 per cent aqueous pyridin and the remaining dye was colorimetrically estimated.

EFFECT OF ELECTROLYTES ON THE FASTNESS TO WASHING

The following Table I gives the results of the amount of the dye stripped at the boil with progress of time. D_∞ denotes equilibrium absorption.

It will be seen from the table that in most of the cases, the dye absorbed is stripped off completely. It is known that the fastness to washing of Sky-Blue FF (C. I. 518) is very poor. In order to see whether dyeing carried out in presence of various electrolytes improves the fastness, the regenerated cellulose was dyed in their presence and then subjected to the washing test. In general, it can be stated that except aluminum sulfate, no other electrolyte has the property of improving the fastness. The increased fastness is due to the absorption of the finely dispersed aluminium salt of the dye-acid.

TABLE I

Concentration of the dye = .05 g/l Sky-Blue FF.
Electrolyte added to the dye-bath = .0855 N.
Temperature of stripping = 100° C.
The regenerated cellulose was dyed in the presence of electrolytes.

NaCl		$Na_2SO_4, 10H_2O$		$MgCl_2, 6H_2O$		$Al_2(SO_4)_3, 18H_2O$	
Time of stripping in mts.	*% dye stripped*	*Time of stripping in mts.*	*% dye stripped*	*Time of stripping in mts.*	*% dye stripped*	*Time of stripping in mts.*	*% dye stripped*
0	0	0	0	0	0	0	0
5	0.29	2	.26	5	0.39	2	0.20
10	0.42	7	0.40	10	0.66	5	0.26
20	0.56	10	0.46	23	0.89	10	0.29
30	0.63	17	0.55	30	0.92	15	0.30
60	0.70	22	0.59	60	1.02	30	0.32
120	0.73	27	0.62	90	1.04	60	0.34
		37	0.64	120	1.07	120	0.37
		82	0.73			240	0.41
D∝	0.73		0.73		1.07		0.61

In the following table are given the equilibrium absorption at the boil by regenerated cellulose, rate of absorption (cf. Neale and Patel, loc. cit.) and the rate of desorption, i.e., the rate at which the dye is stripped.

TABLE II

Conc. of dyestuff = .05 g/l Sky-Blue FF.

Electrolyte added	*Normality of Electrolyte*	*% die absorption*	*Rate of absorption x 10^{+8} cm^2/mt*	*Rate of desorption x 10^{-8} cm^2/mt*	*% dye removed in ten minutes*
NaCl	0.0855N	0.73	13.1	8.6	57.5
$MgCl_2, 6H_2O$	0.0855N	1.07	11.5	6.9	61.7
$Na_2SO_4, 10H_2O$	0.0855N	0.73	12.8	8.9	63.0
NH_4Cl	0.0855N	0.93	13.1	10.2	61.3
$NH_2PO_4, 12H_2O$	0.0855N	0.52	14.2	8.2	60.0
KH_2PO_4	0.0855N	0.99	11.2	10.0	62.6
$Al_2(SO_4)_3, 18H_2O$	0.0855N	0.61	10.6	...	47.5
$BaCl_2, 2H_2O$	0.0342N	2.20	5.2	6.3	57.5

The rate of desorption which is calculated in the same manner as that of absorption is less than that of the latter. From the results, it can be seen that any attempt made to co-relate the amount of the dye absorbed at equilibrium in presence of various salts, the nature of the cat-ion or the rate of absorption with the rate of desorption is bound to fail. The fact, however, remains that at the concentration of the electrolytes used, the rate of desorption is less than that of absorption. This is due to the fact that the most of the dye micelles in presence of the electrolyte concentration used, are not big enough to be deposited on the surface of the fiber or blocking the capillary spaces of the absorbent. If such a state of affairs is brought about by the addition of large amounts of electrolytes, the rate of desorption should be greater than that of absorption.

When 0.855 N and 1.71 N salt solution was added to the dye-bath, the dyestuff was completely salted out in the cold but on heating, a clear solution was obtained. However, it is not wrong to assume that the dye micelles under such circumstances are very big. The following table shows that when large aggregates are absorbed, the rate of desorption is very great—greater than that of absorption.

TABLE III

NaCl	*Equilibrium absorption*	*Rate of absorption cm^2/mt*	*Rate of desorption cm^2/mt*	*% dye removed in ten minutes*
0.855N	3.55	$5.7 \times 10^{+8}$	15.3×10^{-8}	81.4%
1.71 N	6.58	$2.8 \times 10^{+8}$	18.7×10^{-8}	90.0%

It is seen that whereas in presence of 0.0855N electrolyte concentration, the amount of the dye removed is between 50-60 per cent of the equilibrium absorption in ten minutes whereas in presence of ten to twenty times salt concentrations, it amounts to 80-90 per cent. The rate of desorption is also greater and not less.

The above results prove beyond doubt that the fastness to washing is greatly affected by the size of the dye micelles. It should, therefore, be pointed out that in those cases where good fastness is required, the depth of the shade should be increased by using a greater concentration of the dyestuff. One should also be careful in being over-

enthusiastic about exhausting the dye-bath.

The following results were obtained when Benzopurpurine 4B (C. I. 448) was used:

TABLE IV

Dye conc. g/l	*NaCl g/l*	*% dye absorbed at 90° C.*	*% dye stripped at 90° C. in 10 mts.*	*Rate of absorption x 10+⁵ cm²/mt*
.05 g/l	1.0	1.13	33.6%	3.17
.05 g/l	2.0	1.80	37.2%	4.36
.05 g/l	3.0	2.50	40.6%	3.67
.05 g/l	5.0	3.31	43.2%	3.73
0.5 g/l	5.0	7.0	46.8%	3.53

It can be seen from the table that with the increase in the amount of the dye absorbed at equilibrium, there is a gradual increase in the amount of the dye removed, even though the rate of absorption first increases and then decreases as usual. Even though the amount absorbed at equilibrium in the case of 0.5 g/l of the dye is more than twice the dye taken up from a dye solution of .05 g/l, the difference in the amount of the dye removed is only 10.0 per cent. In those cases where the dye concentration is kept constant and the amount of the added electrolyte is varied so as to increase absorption, the dye stripped off from the dyed material gradually increases.

NATURE OF THE DYESTUFF AND FASTNESS

From the foregoing, it can be seen that the desorption of the fastness to washing is dependent upon various factors such as the amount of the dye absorbed at equilibrium, the way in which it is increased along with the concentration of the electrolyte added to the dye-bath. It was thought that perhaps, the study of desorption of a number of dyestuffs might yield some interesting data as the substantive dyes differ greatly in their colloidal properties in aqueous solutions.

TABLE V

Name of the dyestuff	*% dye absorbed at equilibrium*	*Rate of absorption x 10+⁵ cm²/mt at 90° C.*	*% dye stripped at 90° C. in 10 minutes*
Chlorazol Fast Orange WS (Similar to C. I. 353)	0.96	6.32	34.4
Benzopurpurine 10 B (C. I. 495)	2.42	5.18	48.0
Congo Red (C. I. 370)	3.12	5.16	47.0
Benzopurpurine 4 B (C. I. 448)	3.31	3.73	43.2
Benzo Fast Scarlet 6 BSL (C. I. 327)	1.16	2.92	25.9
Benzo Fast Scarlet 8 BS (C. I. 326)	1.46	2.90	27.2
Benzo Fast Scarlet 4 FB (C. I. 326)	2.22	2.12	29.3
Chlorazol Fast Scarlet 4 B (Similar to C. I. 327)	2.21	1.22	15.0
Chlorazol Brown LF (C. I. 561)	2.05	1.12	14.2

It is seen from the results obtained that the amount of the dye absorbed at equilibrium is in most of the cases not related to the quantity of the dye removed in ten minutes if the nature of the dyestuff is different. However the rate at which the dye is taken up shows a more rational relationship within wide limits, no doubt, with the amount of the dye stripped. Thus in those cases where the diffusion coefficients lie between 1 and 3, the amounts of the dyes washed out vary from 10-30 per cent whereas where the rate of absorption is very great, the amount of the dye removed is greater than 50 per cent. Thus those dyestuffs which are greedily taken up by cellulose will be very poor to washing. Technical experience has shown this to be the case.

TEXTILE AUXILIARIES AND FASTNESS

Various substances are suggested and put on the market to increase the washing fastness of substantive dyestuffs. The fastness can only be increased if the absorbed dye is made almost insoluble on the fiber by the formation of an insoluble complex organic compound or by replacing the sodium by some other cat-ion which would convert the dye into the insoluble compound. It has been pointed out that when the fiber is dyed with a solution of Sky-Blue FF to which aluminum sulfate has been added, the fastness to washing improves a little. In this case alone, it was found impossible to remove more than 67.0 per cent of the total dye absorbed even after boiling the dyed material for four hours in pure water. No doubt, this increased fastness is due to the formation of an insoluble salt with the dye-acid.

During the study of the various inorganic substances with reference to the washing fastness of the substantive colors, it was found that if the dyed material is treated with .05 per cent aqueous solution of thorium nitrate for ten minutes at the boil, the fastness to washing remarkably increases. However, in presence of a dilute soap solution or alkali water, the after-treated material exhibits its original weakness to stripping.

EFFECT OF HEAT ON FASTNESS

It was thought that perhaps the condition of drying the dyed material might have some effect on the fastness-to-washing. The dyed material was dried under three different conditions.

(a) dried at room temperature for 24 hours.
(b) dried in the steam oven at 110° C. for 24 hours.
(c) dried between filter papers and at once placed in the stripping bath for ten minutes.

The pieces were dyed to equilibrium at 90° C. in a dye-bath containing .05 g/l Benzopurpurine 4B and 5.0 g/l sodium chloride. The amount of the dye stripped in ten minutes in all the three cases was the same, namely 40.0 per cent. This is probably due to the fact that whatever differences are brought about by the different conditions of drying the dyed material, the intermicellar spaces of

cellulose soon swell up and become wide enough for the easy exist of the dye micelles, soon after it is suspended in water.

From the data presented in this paper, it will be clear that attempts to increase the fastness of the material dyed with substantive dyestuffs to washing, should be directed towards converting the dye molecule absorbed by the fiber into a substance which has very negligible solubility either in water or in dilute soap solutions. Looking to the fact that the substantive colors are the sodium salts of the sulfonic acids of substances with high molecular weights, it seems quite possible that by substituting the sodium radical by a complex cation, the fastness can be increased. This has been achieved partly.

It has been pointed out that those dyes which are absorped very rapidly are very poor to washing. However, these are the colors which are generally used for obtaining level shades on viscose. Hence, the importance of exploring new and untrodden avenues for increasing the fastness to washing cannot be either overemphasized or overestimated. It will be conceded that the greater rate of absorption is due to the greater dispersity of the dye solution whereas a decreased rate of diffusion of the ionic micelles is due to the presence of larger aggregates. In either case, the fastness-to-washing is poor; however, the causes are quite different. In one case, the dye micelles are so small compared to the radii of the intermiceller spaces of the material that the absorbent acts as a filter to most of the ionic micelles whereas in the other, they are so big that they block the capillary spaces and are only adsorped on the surface. It is, therefore, contended that in order to make a dyestuff comparatively fast to washing, there is an optimum size of the dye micelles. A study of the particle size of and the charge carried by the dye micelles of some of the substantive dyestuffs mentioned in Table V will elucidate the most appropriate methods of preparing dyestuffs which would confirm to the maximum particle size that would neither be too small nor too big.

WASHINGTON NEWS LETTER

WALDON FAWCETT

DESTINED, doubtless, to have far-reaching if indirect reactions upon the cause of design protection and textile identification are several concurrent developments. Foremost of these is the unanimous decision of the United States Supreme Court upholding the constitutionality of the model Fair Trade Act, as exemplified by the State statutes of Illinois, California, and other States. The action by the Supreme bench came as a shock in certain quarters,—notably in New York, where the higher courts had vetoed a similar expedient for predicating price-fixing privilege upon property rights in distinguishing marks, names, and labels.

According to competent prediction the inevitable consequence of judicial approval of the so-called Fair Trade principle will be to give tremendous stimulus to trade marking, via both national brands and private brands. By the same sign, there is supplied a fresh incentive for design protective legislation, particularly in so far as Design Registration or Design Copyright might operate to render individualistic, original designs recognizable and protectible as mediums of identification.

Set over against this development are the more doubtful benefits of the movement to render compulsory State by State registration of trade marks. The pattern is indicated by the Bills pending in Kentucky and Nevada. In so far as obligatory registration would operate to place industry on notice with respect to preempted marks, and thereby lessen the risks of duplication, the program might prove a blessing. The stand-off is in the apprehension of manufacturers engaged in national distribution who fear that if State franchises be available to the first applicants, primary producers must fortify with multiple registrations, lest their goods arrive at State boundaries to find "signatures", color plans, etc. preempted by State registrants.

Before industry has had opportunity to adjust itself to the first Patman Act, designed to iron out price inequalities in distribution, warning is sounded of a second proposal by the same author designed to prevent manufacturers in every line from engaging direct in the distribution of their goods at retail. The effect of the initial Patman Act, no less than the above-mentioned decision by the Supreme Court, must be to stimulate every process of commodity identification that can operate to integrate control of goods and life above competition distinguishable specialties. Finally, as current contributions to the legislative reshuffle, we have the 1937 edition of the Food and Drug Act.

THE NEW FOOD, DRUGS AND COSMETICS BILL

The new draft, by Senator Copeland of New York, introduced in the 75th Congress under the designation S 5 stiffens as to enforcement but does not fundamentally change the ban on the use of uncertified and impure coal-tar colors in food, drugs and cosmetics. Note, however, the extension of the police power to cosmetics, not previously embraced.

Under Section 20 of the new bill which defines adulterated cosmetics it is provided that the strictures shall not apply to coal-tar hair dyes the label of which bears the

(Continued on page 80)

PROCEEDINGS OF THE
American Association of Textile Chemists and Colorists
FEBRUARY 8, 1937

Officers of the Association

WILLIAM H. CADY, *President*
U. S. Finishing Co., Providence, R. I.

ALBAN EAVENSON—ELMER C. BERTOLET, *Vice-Presidents*

WILLIAM R. MOORHOUSE, *Treasurer*
National Aniline & Chemical Co., Boston, Mass.

HAROLD C. CHAPIN, *Secretary*
Lowell Textile Institute, Lowell, Mass.

LOUIS A. OLNEY
President Emeritus and Chairman of the Research Committee
Lowell Textile Institute, Lowell, Mass.

Councilors-at-Large

BERKELEY L. HATHORNE — HAROLD M. CHASE
G. R. KREMERS — ARTHUR E. HIRST
CARL Z. DRAVES — HENRY F. HERRMANN

Councilors Representing Sections

BEN VERITY (Rhode Island) — R. M. RITTER (Philadelphia)
HANS MEYER (New York) — ELMER F. SMITH (Midwest)
ROLAND E. DERBY (N. New England) — R. S. WHEELER (South Central)
C. A. JONES (South Eastern) — CHESTER L. EDDY (Piedmont)

Local Sections and Their Officers

Northern New England Section
Carl Z. Draves, Chairman, Ludlow Mfg. & Sales Co., Ludlow, Mass.
John N. Dalton, Secretary, Pacific Mills, Worsted Division, Lawrence, Mass.

Rhode Island Section
John G. Masson, Chairman, Rosemont Mill, Woonsocket, R. I.
Raymond A. Pingree, Secretary, 7 Sayles Ave., Saylesville, R. I.

New York Section
George L. Baxter, Chairman, Bradford Dyeing Association, 40 Worth St., New York, N. Y.
P. J. Kennedy, Secretary, E. I. duPont de Nemours & Co., Inc. 61 Thomas St., New York, N. Y.

Philadelphia Section
Herbert S. Travis, Chairman, Rohm & Haas Co., Inc., 222 West Washington Square, Philadelphia, Pa.
R. W. Delaney, Secretary, National Aniline & Chemical Co., 200 S. Front St., Philadelphia, Pa.

Piedmont Section
Thomas R. Smith, Wiscasset Mills Co., Albemarle, N. C.
A. Henry Gaede, Laurel Soap Mfg. Co., Charlotte, N. C.

South Central Section
Walter E. Hadley, Chairman, Standard Coosa Thatcher Co., Chattanooga, Tenn
Murray B. Smith, Secretary, 2404 Union Ave., Chattanooga, Tenn.

Midwest Section
Arthur T. Brainerd, Chairman, Ciba Co., 325 W. Huron St., Chicago, Ill.
Elias A. Johnson, Secretary, National Aniline & Chemical Co., 357 W. Erie St., Chicago, Ill.

South-Eastern Section
C. A. Jones, Chairman, Georgia School of Technology, Atlanta, Ga.
Robert H. Harris, Secretary, Spalding Knitting Mills, Griffin, Ga.

Lowell Textile Institute Student Section
Lee Gale Johnson, Chairman; Hugh Francis Carroll, Secretary.

North Carolina State College Student Section
A. E. Shumate, Chairman; J. W. Furr, Secretary

Philadelphia Textile School Student Section
John L. Waldo, Chairman; Wayne F. Fry, Secretary

Members should notify the **Secretary** immediately of all address changes

Annual Business Meeting

Saturday, December 5, 1936

THE session convened at twelve fifteen o'clock, President Cady presiding.

President Cady: The meeting will please come to order.

I will call on the Secretary for his report.

SECRETARY'S REPORT

Secretary Chapin: The membership of our Association continues to show healthy growth, confined to no single Section or group of Sections. Two years ago it had risen from depression to a new peak. Now it is over thirty per cent greater. Without counting applicants there were in good standing at the end of October members classified as follows. For comparison a summary of last year's figures also is given.

	Active	*Junior*	*Associate*	*Student*	*Totals*	*Oct. 31, 1935 Totals*
N. N. E.	230	33	20	1	284	273
R. I.	185	21	18	1	225	210
N. Y.	328	23	30		381	363
Phil.	227	23	29	6	285	264
Pied.	155	31	34		220	174
S. Central	37	3	4	1	45	45
S. E.	31	4	8	7	50	48
M. W.	116	6	13	1	136	108
Student Sect.				18	18	33
No Section	44	8	4		56	47
Totals	1,353	152	160	35	1,700	1,565
Corporate					28	28
					1,728	1,593

Council meetings 103 to 109, and Research Committee meetings 96 to 102 were held and reported as follows:

Boston, Nov. 1, 1935, Am. Dyestuff Reptr. 24, P347 and 346 (1935).

Chattanooga, Dec. 7, 1935, Am. Dyestuff Reptr. 25, P17 and 48, (1936).

Providence, Jan. 24, 1936, Am. Dyestuff Reptr. 25, P129 and 106, (1936).

New York, March 6, 1936, Am. Dyestuff Reptr. 25, P158 and 157, (1936).

Philadelphia, Apr. 10, 1936, Am. Dyestuff Reptr. 25, P278 and 279, (1936).

Boston, June 12, 1936, Am. Dyestuff Reptr. 25, P386 and 385, (1936).

New York, Oct. 16, 1936, Am. Dyestuff Reptr. 25, P728 and 729 (1936).

President Cady: You have heard this report, gentlemen. What is your pleasure?

Mr. Rose: I move it be adopted.

. . . The motion was carried, after being duly seconded.

President Cady: We will now listen to the report of the Treasurer.

TREASURER'S REPORT

Treasurer Moorhouse: The Treasurer's report for the fiscal year of 1935 to November 3, 1936 is as follows:

	Research	*Mdse.*	*General*	*Annual Meeting*	*Total*
Cash on hand—					
Nov. 1, 1935	$ 3,294.03		$11,313.32		$14,607.35
Receipts — Nov. 1, 1935 to Oct. 31, 1936:					
From—Dr. H. C.					
Chapin, Sec.	2,331.00	658.96	8,368.53	270.00	11,628.49
Tex. Found.	12,875.00				12,875.00
Chem. Found.	2,600.00				2,600.00
Eavenson & Levering Co.	2,500.00				2,500.00
Int. on Time Deposit			82.05		82.05
	$23,600.03	$658.96	$19,763.90	$270.00	$44,292.89
Exp. Nov. 1, 1935 to Oct. 31, 1936	$17,898.91	$282.14	$ 6,210.92	$ 79.66	$24,471.63
Cash on hand Oct. 31, 1936	$ 5,701.12	$376.82	$13,552.98	$190.34	$19,821.26

Bank Balance—October 31, 1936

First National Bank of Boston—Time Deposit	$ 5,000.00
First National Bank of Boston—Checking Account	14,821.26
Cash on hand—October 31, 1936	$19,821.26

STATEMENT OF CASH POSITION

	General	*Research*	*Total*
Cash on hand— October 31, 1935	$11,313.32	$3,294.03	$14,607.35
Cash on hand— October 31, 1936	14,120.14	5,701.12	19,821.26

Comparison of Actual Receipts and Expenditures in Total for Years Ending October 31, 1935 and October 31, 1936.

GENERAL FUND

	Year Ending 10/31/35	*Year Ending 10/31/36*
Total Receipts	$ 9,571.34	$ 9,379.54
Total Expenditures	5,813.18	6,572.72
Surplus	$ 3,758.16	$ 2,806.82

RESEARCH FUND

Total Receipts	$11,373.00	$20,306.00
Total Expenditures	9,575.56	17,898.91
Surplus	$ 1,797.44	$ 2,407.09

Our expenditures this year in the General Fund are a little more than they were last year. Still we have a surplus in that fund of $2,806.82. Our expense for research work was very much more than it was last year but our receipts were very much more. We have a surplus in that fund also. That is mostly surplus that comes from corporate members and sustaining members.

President Cady: Gentlemen, you have heard this report. What is your pleasure?

. . . A motion to adopt the report was carried, after being duly made, seconded, and put to a vote. . . .

President Cady: I have asked Doctor Scott to present the report of the auditors.

AUDITOR'S REPORT

Dr. Scott: We have examined the books, records and reports of the Treasurer and Secretary of the American Association of Textile Chemists and Colorists for the period beginning November 1, 1934 and ending October 31, 1936, or the last two fiscal years. The previous audit made by Mr. Alex. Morrison was as of January 22, 1935.

The Treasurer's report as of October 31, 1936, which will be submitted by Mr. Moorhouse at the annual meeting in Providence on Friday of this week, December 4th, is a true and accurate statement of the financial condition of the Association and conforms in all detail with the books. The cash on hand, according to the cash book and Treasurer's report, is in agreement with the bank statements. The total cash receipts were checked with duplicate deposit slips, pass book entries and bank statements and found to be correct. The receipts and deposits of all checks transmitted by Dr. H. C. Chapin, the Secretary, to Mr. W. R. Moorhouse, the Treasurer, coincide, and the records of the Secretary are in accord with the books of the Treasurer. All the expenditures of the Treasurer were made on properly approved vouchers.

Dr. Chapin has suggested that for his record of receipt of dues he will use in addition to the present day book a copy of the last Year Book, which will be constantly kept in an accurate condition by the cancellation of names dropped from the membership rolls and the addition of new members, with such revisions in membership classification as might be necessary. Against the names, the payment of dues will be recorded with the date of receipt and this will enable anyone to quickly reconcile the receipts of the Secretary from dues for a fiscal year as well as quickly prepare a statement of outstanding dues payable. As in the case of accounts receivable, the only method of determining the absolute accuracy of the receipts from dues would be to send verification statements to individual members, which has never been done and is not recommended.

The suggested change in the manner of keeping the records of the Secretary will be more practical in maintaining an accurate mailing list with the Howes Publishing Company and the correct determination of charges against the Association.

The books of the Association, of course, are kept on a cash basis as the only assets consist of cash on hand and inventories under the control of the Secretary, consisting of dyed standards, publications, etc., for which cash expenditures are made, and funds covering the resale of such material are covered by checks transmitted from the Secretary to the Treasurer. The actual value of unsold material, which would necessitate the taking of an inventory at a correct appraisal, was not determined by us as the total amount involved was not particularly large and the Secretary is very diligent in protecting the interests of the Association on this type of asset.

The books and accounts of both the Treasurer and the Secretary are being maintained in a very satisfactory manner.

President Cady: Is there any discussion of this report? If not, what is your pleasure?

. . . A motion to approve the report was carried, after being duly made, seconded and put to a vote. . . .

President Cady: We now come to the matter of the proposed amendments to the constitution. I will ask Doctor Chapin to read them.

PROPOSED AMENDMENTS

Secretary Chapin: At the 109th Council meeting on Friday, October 16, 1936, there were proposed the following amendments to the Constitution of the Association, designed, it was explained, to permit holding the usual annual general meeting of the Association at any date in each year chosen by the Council, without changing the Constitution in other respects, except to keep the election of officers strictly annual in November by mail ballot, as at present, rather than shifting to accord with possibly shifting annual meeting dates.

Proposed Amendments—Article VIII: Change the first sentence of paragraph 1 to: "In each year, as herein provided, there shall be elected a President, two Vice Presidents, a Treasurer, and as many Councilors-at-Large as may be required to bring their total number to six."

In paragraph 2 substitute for sentences 2 and 3, "Two Councilors-at-Large shall be elected in each year to serve three years, and others may be elected if necessary to complete three-year terms left incomplete by resignation or otherwise."

For paragraphs 4, 5 and 6 substitute, "The Secretary shall mail to every Active member, by November 15th, a ballot bearing the name of every nominee. Ballots marked and returned to the Secretary by December 15th shall elect officers for terms beginning January 1st. An executive office left vacant for any reason may be filled temporarily, until the next annual election, by vote of the Council."

Article IX—For the second sentence of paragraph 1 substitute, "At each general meeting it shall present a report of its proceedings since the last preceding general meeting."

Article XII—For "annual meeting" substitute "General meeting."

President Cady: Unless there is some further explanation of these amendments necessary, it would expedite matters if we could adopt the entire report in a single vote. Will someone make a motion?

Mr. John G. Masson: Do I understand. Mr. Chapin, that local Sections will not have to send a report on the outings to the Treasurer any more?

Secretary Chapin: It simply condenses the report to cover what is received from the general treasury and the expenditures of those sums, excluding other material.

Mr. Hugh Christison: If they used the Association funds for the outing then they would have to report?

Secretary Chapin: Then they would have to report.

Mr. Moorhouse: It wouldn't prevent them from giving a full detailed report but it wouldn't oblige them to do so.

Secretary Chapin: But probably it would be segregated into two sections, that covered by this amendment and the supplementary report covering other receipts and expenditures therefrom.

Mr. Moorhouse: Regarding the Treasurer's reports for Sections under this new amendment, I was going to suggest to the Secretary that he outline a suggestive form for transmitting the report to the Secretary. Then they will know just how you would like to have them. I think the reports that have come in to me have varied considerably. Some have a lot of detail, some very little. I think if they knew exactly what details we would like to have it would help them also in making their own reports to their own chairmen of sections.

Secretary Chapin: It was my thought in endeavoring to word these amendments according to what I believe to be the desires of the Council, to have the reports come to the Secretary purely as a matter of record, because the Secretary is the first signer of vouchers permitting further payments to Sections, payments of all sorts. Therefore information should be first available to the Secretary as to whether such vouchers can be issued.

It was my purpose, having recorded the receipt of the report, to transmit it to the Treasurer for his record. It would seem to me that the form of that report should be prescribed by the Treasurer rather than by the Secretary, because it is purely a financial matter.

Mr. Moorhouse: I would be glad to do it but I think the proper place for the report to go is to the Secretary, not the Treasurer.

Secretary Chapin: In other words, you feel that the Secretary should retain those records?

Mr. Moorhouse: Yes. I will be glad to help you on the form, or have one of my men help you.

Secretary Chapin: If any form is to be made out I would much prefer that it be done by you.

Mr. Moorhouse: I will be glad to have that done for you, but I think you ought to send them out.

President Cady: Is there any further discussion of these amendments? Will someone make a motion to adopt them?

Mr. Zisman: I move they be adopted.

. . . The motion was duly seconded. . . .

President Cady: If there is no further discussion all those in favor say, "Aye"; opposed, "No." The motion is carried.

Just as a matter of record I might state that the Council yesterday voted to hold the next annual meeting in Philadelphia in 1937. The following meeting, that is, a year thereafter, will be held in Atlanta, but the time of that meeting has not yet been decided.

The report of the tellers has been handed in. I will now announce the result of the annual election of officers. The exact figures are available if anybody wants them, but there seems to be no doubt as to who was elected. (Laughter).

For President	William H. Cady
Vice President	Elmer C. Bertolet
Vice President	Alban Eavenson
Treasurer	William R. Moorhouse
Councilors-at-Large	Berkeley L. Hathorne
	G. R. Kremers

Gentlemen, I can't speak for the rest of the officers, but on my own behalf, I wish to thank you for your expression of confidence. I will do the best I can for the next year.

Is there any other business to come before this meeting.

Secretary Chapin: I would like to make one suggestion in connection with the nomination of officers.

It is obvious that the Nominating Committee, consisting of eight members of the Association, one from each Section, with the Secretary of the Association as chairman without vote, has very great power in determining who shall be the officers of the Association—one of the most important duties that any group in the Association has. I am sorry to say that the selection of the members of that Nominating Committee is not always taken with the great seriousness that it should be. I would urge upon everybody to exert himself to his utmost to see that members of this Committee are elected promptly, that the best men available are chosen—as of course they have been in the majority of instances—and that the members of the Committee be instructed by the members of their Sections as to whom they desire for officers of the Association.

If the members will take upon themselves that duty, the Secretary will do his utmost to see that the balloting by that Committee is conducted in the most impartial manner possible.

It is not within the right of the Secretary to influence the balloting in any manner whatsoever. It is distinctly his duty to preserve a fair ballot, a fair selection of these nominees.

President Cady: Is there any further business to come before this meeting?

Mr. Moorhouse: I move we adjourn.

. . . The motion was duly seconded, put to a vote and carried, whereupon the meeting adjourned at twelve forty o'clock. . . .

—— ♦ ♦ ——

The Evaluation of Chemical Tendering of Cellulose by Cellulose Viscosity Measurement*

F. H. GUERNSEY and L. T. HOWELLS†

INTRODUCTION

THE purpose of this paper is to emphasize the importance of control of chemical tendering in processing cellulose fabrics and to recommend the viscosity method for the measurement of this factor. We have been particularly interested in the effect of subsequent treatment of new textile fabrics, such as laundering, to which practically all cotton fabrics are subjected. The life in service of cotton goods is directly related to the chemical tendering brought about in manufacturing processes and unfortunately the measurement of chemical tendering by tensile strength tests does not always give a true picture of the condition of the fabric. Cotton can be seriously tendered in processing and yet not lose appreciable strength until subjected to the action of hot soap and alkali, as in laundering. This means that a fabric can be manufactured and tested for tensile strength and

*Presented at Saturday morning session, Annual Meeting, Providence, R. I., Dec. 5, 1936.

†Cowles Detergent Co.

pass as satisfactory. Yet, when this fabric is subsequently laundered, it may lose a great deal of strength for which the consumer or laundryowner, in many cases, unjustly shoulders the responsibility. A-1 merchandise should retain its strength when treated in an approved commercial laundry and, if the viscosity method is used in conjunction with tensile strength measurements, the manufacturing processes can be controlled to the satisfaction of all concerned.

A very accurate and practical viscosity method for the evaluation of chemical tendering has been prepared by the Fabrics Research Committee and the work of Clibbens and Geake and Clibbens and Ridge has proved that the method is capable of satisfying both the manufacturer of cotton goods and those who have to handle the goods after they have been purchased.

Tensile Strength

At the present time the most widely used index of durability and condition of fabric is tensile strength. In spite of the fact that the determination has many shortcomings it was, for a long time, the only practical method available. If the determinations are made under comparable, standard conditions, and sufficient tests are run to average-out erratic unavoidable discrepancies, the average strength of a fabric can be used to advantage. However, it should be remembered that fabric construction, flaws and original condition of the goods influence the results of even the most careful determination and tensile strength alone does not indicate the extent to which a fabric will stand up in service.

Limitations of Tensile Strength

Tensile strength tests are limited in their scope and a line cannot be drawn as to how much of the loss is due to chemical tendering and how much is due to mechanical wear. Fabrics can be reduced in tensile strength by wear and abrasive action in the total absence of chemical treatment or they can be reduced in tensile strength by chemical means in the total absence of wear and abrasive action. They can also be chemically tendered without losing strength until they are subsequently treated in service. It is thus apparent that tensile strength tests are unreliable as a specific measure of either chemical or mechanical tendering.

In evaluating tensile strength, therefore, we are confronted with two major factors, i.e., structural strength and degree of chemical tendering. If the structural strength of fabric were constant and unaffected by wear, it would be possible to evaluate chemical tendering through tensile strength loss, but unfortunately, it is not constant. The structural strength of fabric is affected by wear, the length of fibers used, the uniformity of spinning and processing the yarn, the weight, the thread count and the style of weave. Other important factors which affect structural strength are shrinkage and the various unavoidable common weaving variations or flaws such as knots, heavy threads, etc. All of the above individually and collectively have a bearing on structural strength, but the degree of true chemical tendering is not affected by these factors. This analysis clearly shows where ambiguity can enter into tensile strength tests in estimating the degree of chemical tendering and accounts for the deception or false security often associated with its use.

The viscosity method for the estimation of chemical tendering has been thoroughly investigated in our laboratory and found extremely accurate and practical for control work. Expression of the results in terms of fluidity is preferred because this factor (reciprocal of viscosity) is directly proportional to chemical tendering.

Fluidity Method of Evaluating Chemical Tendering

The method adopted (Clibbens and Geake) for fluidity determination is based on the measurement of the change in fluidity of the liquid cuprammonium hydroxide when cotton is dissolved in it. Cuprammonium hydroxide is a solvent for cotton and cellulose derivatives and is made by reacting copper with ammonia in the presence of oxygen. Pure cotton (cellulose) when dissolved in cuprammonium lowers its fluidity (increases viscosity) whereas degraded cotton (oxycellulose and hydrocellulose) has comparatively no effect on its fluidity. From this, it is evident that the greater the fluidity of a solution of cotton in cuprammonium, the greater the extent of chemical tendering. If, for example, one piece of new bleached cotton sheeting gave a fluidity of 10 reciprocal poise and another gave a fluidity of 15 reciprocal poise, we would know that the latter had suffered a greater degree of chemical attack in processing and would not last as long in service. This is independent of the tensile strength of the fabric which may or may not reveal that one piece has suffered a greater chemical attack than the other.

How Fluidity is Determined

Fluidity determinations are carried out in an especially constructed viscometer which consists of a long tube (resembling a burette) on which are etched three rings (Fig. 1). In this viscometer the sample can be dissolved so that an effect of exposure to air is eliminated. The tube is joined to a short calibrated capillary tube at the bottom. The upper end of the instrument is closed with a rubber stopper which also carries a short capillary tube. In use, both ends of the instrument are sealed with the aid of rubber tubing and screw clips. These instruments are constructed to rigid specifications so that the constants necessary in determining fluidity of cuprammonium solutions fall within the limits required in practice. The constants of the viscometer are readily calculated through the use of a standard glycerine solution of known fluidity and water at the same temperature. The cuprammonium hydroxide solution which is used as the solvent for cotton is made in

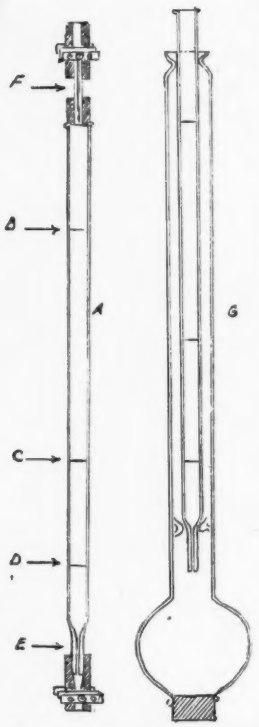


Fig. 1—Viscometer Used in the Determination of the Fluidity of Cuprammonium Solutions of Cotton.

an especially constructed apparatus by which air is blown through a cooled mixture of metallic copper and concentrated aqueous ammonia. Before use the solution is analyzed and adjusted to contain a specific amount of copper and ammonia per liter so that the solvent action and properties of the solution are constant. For storing the solvent we use a refrigerating unit thermostatically controlled at 20° C. so that variations in temperature do not cause loss of ammonia by building up back pressure in the container (Fig. 2).

The method has the advantage in requiring only a small sample (approximately .1 gram). In the measurement of fluidity, a .5 per cent solution is made up by weighing the amount of the sample required for the volume of the viscometer. The volume of the viscometers run approximately 20 cc.'s and the samples required, therefore, run approximately .1 gram. The material in its air-dry condition is figured at 6 per cent moisture which is sufficiently accurate for control work. After closing the viscometer at the capillary end, it is half filled with the solvent and a known quantity (exactly .7 cc.) of clean mercury is added to assist in dissolving the cotton. The sample is placed in the instrument which is then filled to capacity with the solvent and fastened at the top to exclude air. After wrapping the instrument in black cloth to prevent exposure to light, to which the cuprammonium is sensitive, it is mounted on a wheel and slowly revolved (about 4 R.P.M.) until all of the cellulose is dissolved. The passage of the mercury from one end of the viscometer to the other, when the instrument is revolved greatly assists in dissolving the sample.

In order to measure the fluidity of the solution, the viscometer is removed from the wheel and the solution brought to constant temperature in a thermostat. The openings at the end of the viscometer are opened when constant temperature is maintained and the time in seconds for the liquid meniscus to fall between the rings on the viscometer are recorded with a stop-watch. From the time in seconds and the constants of the instrument, the fluidity of the solution can be readily computed in units of reciprocal poises. The fluidity expressed in reciprocal poises gives an excellent system for evaluating chemical tendering and for convenience we refer to the fluidity of one reciprocal poise as the Chemical Tendering Unit or C.T.U.

Fluidity as a Measure of the Extent of Chemical Tendering in Textile Processing

The Fabric Research Committee have published a classification of cellulosic materials according to their fluidity in .5 per cent solution at 20° C. which serves to denote the extent of chemical tendering and which is entirely independent of tensile strength tests.

Class I (1 to 5 C.T.U.'s) comprises very mildly prepared scoured or scoured and bleached cottons.

Class II (5 to 10 C.T.U.'s) is represented by normal scoured and bleached cotton for Textiles.

Class III (10 to 20 C.T.U.'s) is represented by many surgical cotton wools, and by Textile cotton that has suffered a significant loss in its tensile strength as a result of chemical processing.

Class IV (20 to 30 C.T.U.'s) is represented by badly over-bleached textile cotton and has suffered a serious loss of tensile strength.

Class V (30 to 40 C.T.U.'s) comprises cotton which show incipient loss of fiber structure as a result of chemical attack and cellulose and some rayon.

Class VI (40 and above C.T.U.'s) contains rayons and over-bleached rayons and all cotton highly degraded by chemical attack.

Control of Processing Through the Fluidity Determinations

From the above, it is obvious that if the fluidity method is used instead of or in conjunction with tensile strength in evaluating the quality of new merchandise, the results will be of greater practical value. If standard C.T.U. values were set up for the various mill operations such as Kier boiling, bleaching and dyeing, then goods could be manufactured which would meet specifications set to give maximum life in service. We are of the opinion that the C.T.U. value is of major importance to both manufacturers and consumers and anyone working on the viscosity method will undoubtedly see its advantages and recommend that it be universally used throughout the industry.

Use of Fluidity in the Control of Chemical Tendering in Laundering

We have done a great deal of work in the control of chemical tendering of cotton fabric in the process of laundering and it was through a study of the results in this field that we became interested in its more widespread application in the textile industry.

To gain a better understanding of the relation between fluidity and the life of cotton materials in service, we refer to the chart (Fig. 3). The complete change of cellulose to its degradation products, oxycellulose and hydrocellulose, is

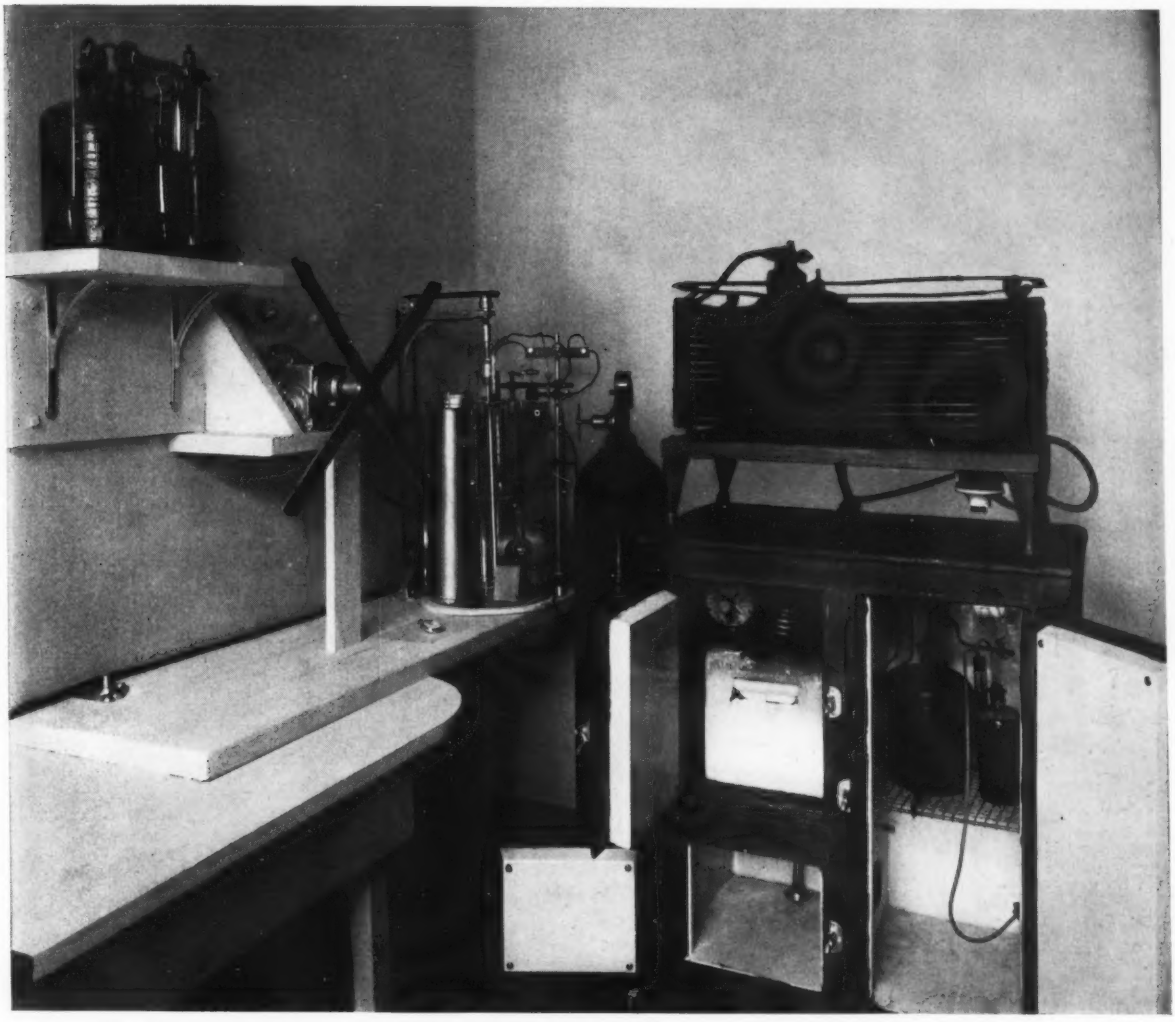


Fig. 2—Complete Assembly of the Apparatus Used in Fluidity Determinations in Cowles' Laboratories

herein represented by a change in fluidity from 1 to 50 C.T.U.'s. A fluidity of 1 C.T.U., represented by the point A, signifies pure undegraded cellulose. A fluidity approaching 50 C.T.U.'s, represented by the point D signifies complete degradation, or 100 per cent conversion of cellulose into its derivatives.

The point B represents the degree of tendering which fabric receives in manufacture (i.e., in boiling out, bleaching and finishing). This point varies in accordance with the treatment received in processing and for the average properly bleached fabric on the market runs from 5 to 10 C.T.U.'s. A fluidity of more than 10 C.T.U.'s on new goods is indicative of over-bleaching or chemical attack in the mill. The point B is termed the "maximum service" point (new goods), because the chemical tendering of any given fabric, when purchased, is lowest at that point.

The point C, referred to as the "end of service" point, represents the degree of chemical tendering that a fabric will stand before it breaks or is torn by the mechanical action received in laundering or in service. It is dependent upon the degree of tendering, structure strength of fabric and the severity of wear. However, for any given fabric, it is determined by the degree of tendering and the laundryowner's problem is to keep the degree of chemical tendering as low as possible in order to prolong the life of the fabric. The "end of service" point for the average weight of cotton sheeting under normal conditions of laundering and wear has been found to be approximately 35 C.T.U.'s. When the chemical tendering of an article approaches this point, it is subject to mechanical damage (holes, tears, etc.) which will cause it to be discarded. The difference between the "maximum service" point B (new goods) and the "end of service" point C represents the available life wear in a given fabric. If, for example, the "maximum service" point of a fabric was found to be 10 C.T.U.'s and its "end of ser-

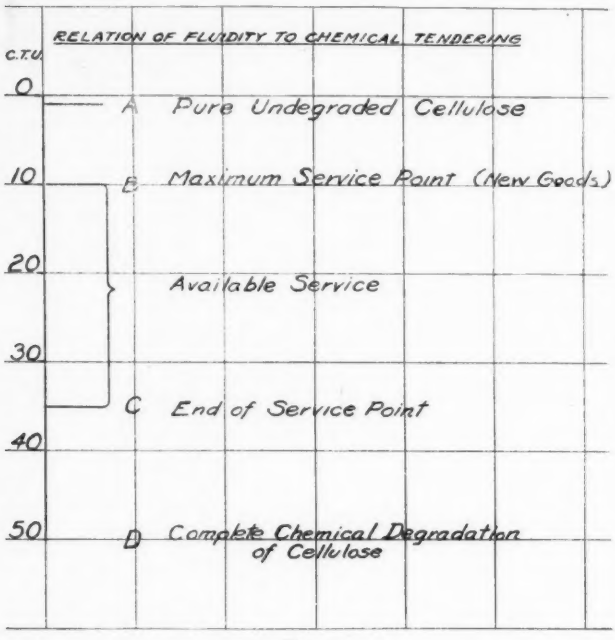


Fig. 3
Chart Showing Relation of Fluidity to Chemical Tendering

vice" point was found to be 35 C.T.U.'s, then a gain in fluidity of 25 C.T.U.'s would determine its life in service. In other words, the fabric in question would stand a gain in fluidity of 25 C.T.U.'s and the life of the fabric would depend upon the gain in fluidity per wash. If the gain in fluidity per wash was held to the minimum through washroom control, the maximum life of the fabric can be expected. On the other hand, if the gain in fluidity per wash is excessive, the "end of service" point (or gain in fluidity of 25 C.T.U.'s) will be reached in a lower number of washes and the life will be shortened accordingly.

Allowable Gain in Fluidity

From the foregoing it is obvious that chemical tendering in the washing process can be clearly expressed in terms of the gain in fluidity of cotton fabric. If the fluidity of a test piece of cotton sheeting is determined before and after 20 washings, the gain in fluidity which results will directly measure the extent of chemical tendering in the washing process.

In determining the allowable gain in fluidity in 20 washes, an elaborate series of experiments was carried out in a large number of representative plants throughout the country. The tests were run to include the average amount of all types of soil, under rigid washroom control in approved formulae, and in every case A-1 dirt removal and whiteness retention were obtained. It was found that a gain in fluidity of 3.5 C.T.U.'s is the maximum allowable limit for chemical tendering on 20 washes.

CONCLUSION

From this work it is apparent that the chemical tendering or C.T.U. value of new goods when placed on the market largely determines its life in service. Since a gain in fluidity of 3.5 C.T.U.'s represents the tendering incurred in 20 approved commercial launderings, it is evident that the accepted maximum C.T.U. value of 10 for new goods is equivalent to approximately 60 launderings. A fabric having an original fluidity of 5 C.T.U.'s will give approximately 30 launderings more than a fabric having an original fluidity of 10 C.T.U.'s and conversely, fabric having an original fluidity of 15 C.T.U.'s will give approximately 30 launderings less. These facts emphasize the importance of control of chemical tendering in textile processing and the need of the use of a method that is more dependable than tensile strength.

From what has been said it is obvious that this method has almost unlimited possibilities in the determination and control of chemical tendering in cotton fabric, and, therefore, serves as a criterion in judging the chemical resistance of new merchandise. It can be used to determine the actual chemical condition of cellulose material without resorting to comparative originals and without having to depend upon the structural strength of fabric.

We believe that standards such as described for laundering can be set up for various mill operations which would serve to determine wherein treatment was excessive.

Starting with grey cotton which has a fluidity of about 1 C.T.U., it should be remembered that when the fluidity reaches 35 C.T.U., the average weight cotton sheeting is no longer fit for service. A low manufacturing C.T.U. is, therefore, essential to quality and durability of new merchandise.

Since the fluidity method accurately determines chemical tendering which takes into consideration the treatment to which new goods are subjected after manufacture, we strongly recommend that it be used in conjunction with tensile strength tests which do not differentiate between the mechanical and chemical condition of yarn or fabric.

REFERENCES

[1]The Viscosity of Cellulose Solutions. Fabrics Research Committee 1932.
[2]Clibbens & Geake J. Text. Inst., 1928 19T.77.
[3]Clibbens & Ridge J. Text. Inst., 1928 19T.389.

DISCUSSION

Member: I should like to ask Mr. Howells if in his work on tensile strength testing he has used the method of heat loss, i.e., loss in tensile strength on heating, to check his tensile strength tests, that is, the method of subjecting samples to 400 degrees Fahrenheit for thirty seconds and comparing that with the tensile strength at ordinary temperatures.

Mr. Howells: No, we have not made any comparisons along that line. The so-called heat test differs from the viscosity determinations in that the former is essentially a qualitative test for the presence of destructive chemicals in the fiber, whereas viscosity determinations are a quantitative determination of the chemical condition of the fiber itself.

Member: That is a very accurate method for determining chemical damage—to show it up.

Mr. Howells: Yes. It would be very interesting to find out how the two methods compare, the viscosity method and the heat method, but I have not had an opportunity to do it and I have not read of anybody who has done any work along those lines.

Mr. Lang: Have you compared this method with the Fehlings solution method that was used widely for oxycellulose determinations?

Mr. Howells: Yes, that has been done by Clibbens and Geake in their Fabric Research Committee report, and I would refer anyone interested in this method to the papers already in print. The method is used extensively in England and is included in a great many specifications on fabrics. To sum up your question, the results of the fluidity determination are considered a great deal more accurate than the Fehlings.

Mr. Mannion: How do we know how much chemical degradation there is in a sample of which we are measuring the viscosity? Do you determine the amount of degradation by the length of chemical processing which has been given to it or by an actual chemical analysis of the number of units within that cellulosic molecule.

Mr. Howells: The question is: how do we determine the amount of chemical degradation in a fabric, whether it is done by analysis or by the length of time that some corrosive chemical has acted upon it?

The answer to that question was given in the paper. Chemical degradation can be determined from the fluidity when the fluidity of 100 per cent cellulose and 100 per cent degraded cellulose is known. The fabric itself is not analyzed for the amount of pure cotton. I do not think there is any method available at the present time to give that.

—— ♦ ♦ ——

The Applicability of Spectrophotometry to the

Solution of Color Problems

in the Textile Industry*

ARTHUR C. HARDY†

WHEN a telephone engineer discusses the subject of telephony, the discussion is likely to concern the design of transmitters, receivers, transmission lines, and automatic switching apparatus. The fact that a telephone permits a conversation to be carried on between persons located some distance apart may never be mentioned. In the same way, it is possible to discuss either spectrophotometers or spectrophotometry but, as the title implies, this paper is concerned almost exclusively with the latter subject.

The first spectrophotometer was built only a relatively few years after the first telephone, and it is patently an under-statement to assert that the spectrophotometer has not been accepted with equal rapidity. There are two reasons for this. When the telephone arrived, everyone was accustomed to conversing with persons close by, and it required little imagination to conceive of carrying on a conversation at a distance. A spectrophotometer, on the other hand, performs a function and yields information that can be acquired in no other manner. Hence, its value was not so readily visualized. A second reason for the relatively slow rate of increase in the use of spectrophotometers can be traced to the nature of the things that have been said and written about them. The spectrophotometer, like the telephone, is an instrument that operates on physical principles, and it generally falls to the lot of the physicist to discuss this subject. The physicist usually concerns himself with the details of the various forms that the instrument may take. This conveys the impression that spectrophotometry is a highly technical subject, whereas the fact is that a spectrophotometer, like a telephone, is merely difficult to construct and is not especially difficult to use.

Although spectrophotometry is often used to good advantage in both ultraviolet and infrared regions of the spectrum, this paper is confined to spectrophotometry in the spectral region where a spectrophotometer competes in some respects with the human eye. It is useful therefore to consider in some detail the procedure by which an observer inspects a piece of colored cloth. This procedure is illustrated somewhat schematically in Fig. 1, which represents an observer looking normally at the surface of the cloth which is illuminated by a cone of light falling on it at an oblique angle. In principle, spectrophotometry differs from this situation in only two respects.

*Presented at Saturday morning session, Annual Meeting, Providence, R. I., Dec. 5, 1936.

†Professor of Optics and Photography, Massachusetts Institute of Technology.

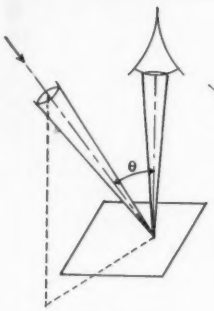


Fig. 1

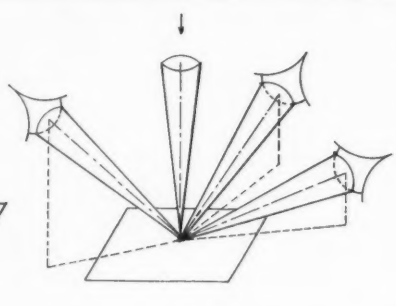


Fig. 2

In the first place, instead of illuminating the test sample with white light, a prism or other suitable device would be inserted in the incident beam. In this way, the sample is illuminated by monochromatic light whose wavelength is adjustable at will. This simplifies the problem because ordinary white light is a mixture of all the various wavelengths, usually in unknown proportions. The second difference is that the observer would be provided with a photometric field which enables the brightness of the test sample to be compared with the brightness of a reproducible white standard under the same illumination. Since both halves of the field are illuminated at all times by monochromatic light of the same wavelength, the characteristics of the visual apparatus of the observer do not affect the results obtained. Indeed, it is possible to replace the eye of the observer by some physical detector such as a photoelectric cell, and, in a properly designed instrument, the characteristics of the cell have no influence on the results.

In practice, an observer would not confine his observations of the test sample to a single mode of illumination and observation. Instead, he would orient the sample at various angles and would attempt mentally to obtain an estimate of the average color. This is represented schematically in Fig. 2 wherein a beam of light falls normally on the surface of the sample and the observer views the sample from various directions, one after the other. A similar result is achieved in spectrophotometry by using what is called an integrating sphere. This device enables the operator of the instrument, in effect, to regard the sample simultaneously from all directions. Although the integrating sphere provides a mode of illumination and observation that is believed to yield the most significant results, it should be understood that a spectrophotometer can be arranged to correspond to any mode of illumination and observation that may be desired.

Assuming that a preferred mode of illumination and observation has been adopted, it is then in order to discuss the possible applications of spectrophotometry, which have here been separated into six categories. In the first place, it is abundantly evident that spectrophotometry provides the only fundamental method of color measurement and specification. This is a direct consequence of the fact that the measurements involve merely the determination of the wavelength and relative quantities of light. This makes it unnecessary to relate the results to any material color standard whose color may not remain constant. This of course suggests the use of spectrophotometry for the maintenance of industrial color standards, which otherwise may drift. Of even greater significance is the fact that it is now possible to begin the creation of a body of color knowledge that will be useful both in this and in succeeding generations. Indeed, if we are ever to acquire a fund of fundamental information regarding the behavior of dyestuffs under various conditions or regarding color combinations that have been found pleasing, it will certainly be through the agency of spectrophotometry or, at least, through the agency of some method of color specification that has its roots in spectrophotometry.

A second important application of spectrophotometry results from the insight that it gives into the behavior of dyes and pigments when they are mixed. Thus, anyone who has once seen the spectrophotometric curve for a typical blue dye, remembers that the dye absorbs in the red, orange, and yellow regions of the spectrum. Since a typical yellow dye absorbs in the blue and violet regions of the spectrum, a textile fabric dyed with a mixture of the two will reflect only that region that is not absorbed—namely, green. Under many conditions, this qualitative reasoning can be made quantitative. The only procedure available to those who are unacquainted with spectrophotometric results is to learn empirically how each dyestuff will behave in mixtures. This is a vastly more complicated procedure because it involves learning what the result will be in the case of all the available dyestuffs taken two at a time, three at a time, etc. in all possible proportions. As evidence that the concepts of spectrophotometry do simplify one's mental processes, it is merely necessary to mention that everyone who has once become familiar with the concepts invariably adopts them as the basis for all his reasoning.

A third category is the analytical ability possessed by a spectrophotometer. In this respect it has no competitor because the human eye has only a very rudimentary sort of analytical ability. Even so common a source as sunlight is not intuitively resolved by the unaided eye into its spectral components. Hence, the fact that the differences between two color samples are indistinguishable to the eye does not mean that their reflection factors are the same at every wavelength. The samples may be a perfect visual match under one illuminant and a poor visual match under another illuminant. On the other hand, matches made under spectrophotometric control are valid under monochromatic light of every wavelength and therefore under every possible illuminant.

The application of spectrophotometry often leads to the discovery of new color phenomena. As an example, ref-

erence may be made to a paper by Dr. R. D. Nutting* who undertook to investigate the common belief that under some circumstances a spectrophotometer is unable to detect color differences that are as minute as those which the trained eye can perceive. One of these classical circumstances is the color difference produced by adding a small amount of crocein scarlet to a wool swatch dyed with tartrazine. It happens that crocein scarlet produces a maximum of absorption at a wavelength of 510 millimicrons in the blue region of the spectrum. It might therefore be expected that, if a spectrophotometer is to show the presence of crocein scarlet, it should be most evident in measurements made at this wavelength. In fact, this assumption is the basis of a procedure by which dyestuffs manufacturers determine dye strengths. The procedure amounts to an abridged form of spectrophotometry in which measurements are made at only one wavelength—namely, the wavelength corresponding to the peak of the absorption band of the dye.

Some typical curves obtained by Dr. Nutting are reproduced in Fig. 3. Curve 1 represents the curve of a wool swatch dyed with tartrazine in a concentration of 1% by weight of the cloth. Curve 2 represents a similar dyeing to which crocein scarlet has been added in the concentration of 0.0001%. Curve 3 shows the effect of increasing the concentration of crocein scarlet to 0.0002%. It will be observed that the presence of crocein scarlet manifests itself, not by decreasing the reflection factor at 510 millimicrons, but by increasing the reflection factor throughout the spectral region beyond 550 millimicrons. To a trained observer, the color difference between swatches 1 and 3 was just discernible, whereas the difference between 1 and 2 was not. However, the importance of this paper is due not so much to its vindication of the spectrophotometer as to the discovery of a new phenomenon in the behavior of dyestuffs. An ideal yellow dye should absorb completely in the blue and violet regions of the spectrum and should not absorb elsewhere. It is apparent from the curves that the addition of minute traces of crocein scarlet, makes tartrazine a closer approach to an ideal yellow. Undoubtedly, further study will indicate that this behavior of crocein scarlet is not unique. Since the effect is not observed in an aqueous solution, the crocein scarlet evidently affects the manner in which the tartrazine is deposited on the wool fibers.

Another advantage accruing from spectrophotometry is the possibility that it provides of representing colors graphically. This is customarily done by assuming a standard observer, and today all civilized countries have officially adopted the observer whose characteristics were specified in the 1931 Report of the International Commission on Illumination. The procedures have been published in several places† and it may merely be mentioned

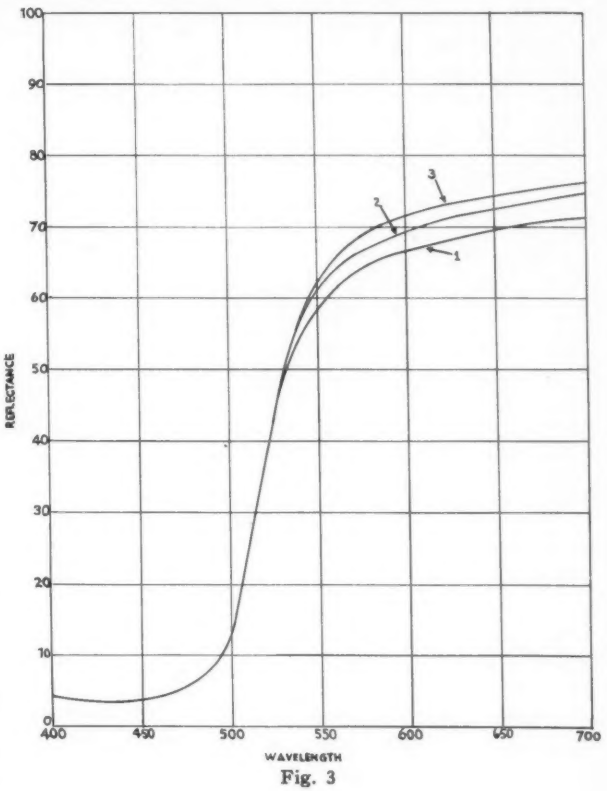


Fig. 3

here that the graphical form of representation to which it leads is exceedingly useful. It is possible, for example, to adopt the routine procedure of graphically recording the color of various shipments of a product whose color is nominally constant. In this way, a line can presently be drawn that will form a closed figure such that all the colors receiving customer acceptance will lie inside the enclosure and all those that were refused will lie outside. This serves then as an indication of a satisfactory tolerance in the commercial production of such a material.

The recent work of Dr. D. L. MacAdam** should also be mentioned in this connection. MacAdam started with the premise that no surface could reflect more than 100% of the light incident upon it nor less than 0%. He then proceeded theoretically to determine what colors could be obtained, assuming unlimited freedom in the choice of spectrophotometric curves. In this way, he was able to construct a color solid containing all colors that can ever be produced. By reference to this solid, anyone engaged in the production of new colors, either dyestuffs or dyed materials, can determine in advance whether it is theoretically possible to achieve such a color. As a guide for research programs. such information is invaluable.

*R. D. Nutting, "The Detection of Small Color Differences in Dyed Textiles." Am. Dyestuff Reporter, *23*, 10, May 7, 1934.

†D. B. Judd, J. Opt. Soc. Am., 23, 359, 1933.
R. D. Nutting, Textile Research, VI, No. 1, November, 1935.
Handbook of Colorimetry (Technology Press, 1936).

**D. L. MacAdam, "Maximum visual efficiency of colored materials," J. Opt. Soc. Am., 25, p. 361, November, 1935.

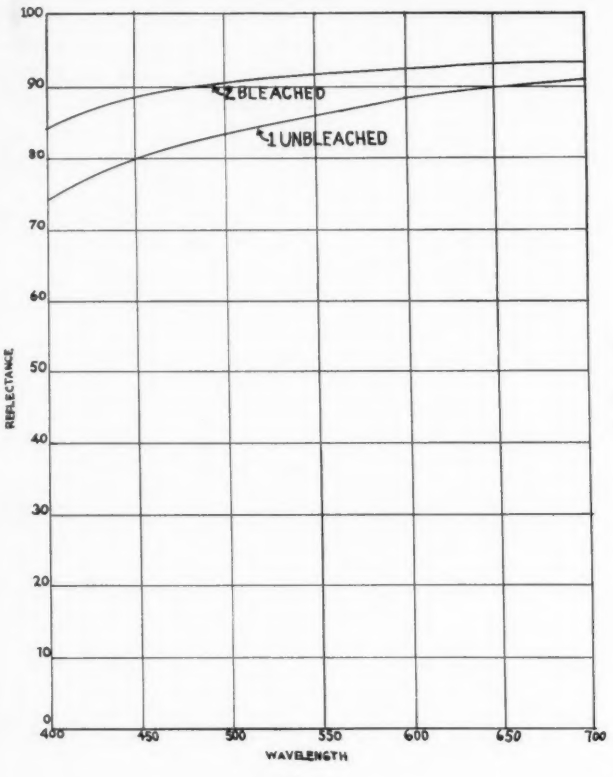


Fig. 4

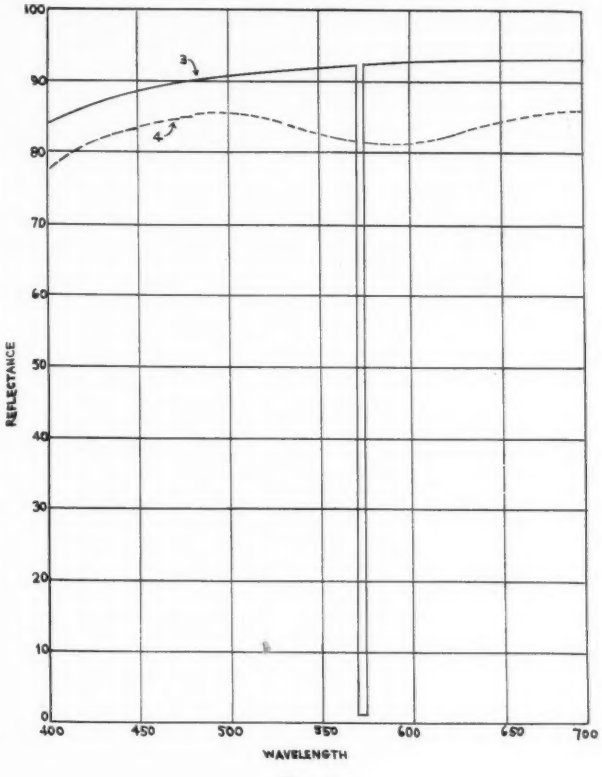


Fig. 5

The last of the six categories is one that is difficult to classify but can be illustrated by an example. Curve 1 in Fig. 4 is the spectrophotometric curve of a piece of unbleached cotton cloth. Curve 2 is the curve for the same cloth after bleaching. It is evident that the bleaching has increased the brightness of the cloth and at the same time has made it less yellow. Assuming that further bleaching is impracticable, a frequent problem is that of neutralizing the residual yellow. The standard method of attack is to dye the cloth with a low concentration of a blue dye, the concentration being sufficient to make the sample neither blue nor yellow. From a purely optical standpoint, the best blue dye is the one that neutralizes the yellowness of the cloth with the least reduction in brightness. This means that all the commercial dyestuffs must be investigated at several concentrations before the "practical" solution to the problem can be found.

Spectrophotometry provides an interesting theoretical solution to this problem. Computations show that, when illuminated by white light, the dominant wavelength of the bleached sample is 575 millimicrons. It can be proved by abstract reasoning that if curve 2 in Fig. 4 could be modified to look like curve 3 in Fig. 5, the yellowness of the sample would be neutralized with the least sacrifice of brightness. This evidently calls for a blue dye having a strong absorption band at 575 millimicrons, the width of the band being such as to just neutralize the excess yellow in the sample.

There are at the present time no commercial blue dyes which meet these specifications. In fact, the practical solution to this problem falls far short of the ideal, as is indicated by curve 4 of Fig. 5. This curve shows that the blue dye which was selected in this typical case absorbs everywhere in the visible region instead of merely in a narrow region centered around 575 millimicrons. As a result of these faulty absorption characteristics, the brightness of the cloth is reduced to approximately the same value as that of the unbleached material.

It is not within the scope of this paper to speculate concerning the possibility of obtaining a dyestuff with the ideal absorption characteristics. It may be mentioned, however, that the odds in favor of finding it are naturally improved by the knowledge of the characteristics that are desired. Moreover, if the desired dyestuff were synthesized by accident, it is probable that its usefulness would not be recognized. A chemist who relies solely on visual judgments of color would find that this dye is an exceedingly pale blue. In fact, the hue of a white cotton swatch dyed to the maximum useful concentration would not be as intense as the yellow hue of bleached (but unblued) cotton. Any chemist who follows precedent would immediately discard such a dyestuff because of its almost

complete lack of tinctorial strength. Unless he had a knowledge of spectrophotometry and colorimetry, he would not realize that tinctorial strength is in this instance an inverse measure of the efficiency of the dyestuff.

This last category of applications of spectrophotometry is difficult to classify because it involves a new type of attack on color problems. This attack resembles the approach to many problems that is provided in its field by the science of thermodynamics. For example, before any experimental work is done on a new refrigeration cycle for an air conditioning system, the theoretical efficiency of the cycle is always calculated. This establishes the ultimate goal which practice may approach but can never surpass. In this way, experiments that are foredoomed to failure are allowed to remain unperformed, and practice is insured against retrogression. Theoretical reasoning in connection with color problems is equally valuable but has been seldom employed because the concepts of spectrophotometry and colorimetry, which provide the foundation, have received only sporadic attention.

—— ♦ ♦ ——

The Suitability of Stainless Steel

Compared with Other Metals in Bleaching*

JOSEPH E. GOODAVAGE†

DUE to a constantly increasing adoption of metal equipment in textile processing, it is of vital importance to know whether or not the metal is suitable in all respects. This is especially true of any equipment subjected to the various operations of the different bleaching processes. The final product of any textile bleaching operation is a white, obtained by subjecting the textile material to a chemical process of bleaching.

Any bleaching operation, whether carried out on fiber of animal or vegetable origin, is usually preceded by a scouring operation.

While this operation of scouring is indispensable and when properly carried out, cleanses the textile material of loosely combined impurities and thus renders it whiter, nevertheless, it cannot be called a bleaching operation. The term bleaching in its present usage implies the treatment of scoured textile materials with bleaching agents that decolorize the natural pigment matter remaining in the fiber after scouring, and whitening it to the required degree.

The physicist tells us that the whiteness of any material is due to a one-hundred per cent reflection of the rays of the spectrum of pure daylight in such a manner so that they harmonize to produce the pleasant sensation of color which we term "white."

According to this explanation the endpoint in bleaching is arrived at by a process of subtraction, i. e. by removing any matter that interferes with this reflection of light rays that produce a white color.

Assuming this point of view, it is highly important that the bleaching process should not contribute anything that interferes with this deduction. The greatest offender in this respect is the presence in the bleach bath of metallic impurities which are directly traceable to equipment unsuitable for the purpose.

This type of impurity has long been recognized as the cause for stains, uneven bleaching, and premature decomposition of the bleaching solution.

The last mentioned factor, is commonly known as "catalytic action" and is economically important where bleaching is carried out in "continuous" or "standing baths," as is often employed in wool bleaching.

It is a matter of common knowledge that peroxide bleach baths are relatively unstable. Being on the alkaline side, a one-volume hydrogen peroxide solution normally used in plant practice breaks down, or decomposes, at a rate that is entirely dependent upon various factors. Some of these, such as pH, temperature, type of alkalining agent and type of water used have been investigated by others[1], and reported upon. All investigators have noticed that metals have a decided effect upon the stability of alkaline peroxide baths[2]. With the increase in use of various metals and alloys for the fabrication of textile machinery, and a wider acceptance of alkaline peroxide solutions as

*Presented at Saturday afternoon session, Annual Meeting, Providence, R. I., December 5, 1936.

†Philadelphia Textile School.

[1]D. J. Campbell, "Peroxide Bleach Baths, and Some Factors Influencing Their Stability," *American Dyestuff Reporter* (Feb. 10, 1936) pp. 67-70.

[2]Ibid Joseph E. Goodavage, "Stainless Steel."

bleaching agents, it becomes imperative that the effect of various metals upon the stability of such solutions be evaluated.

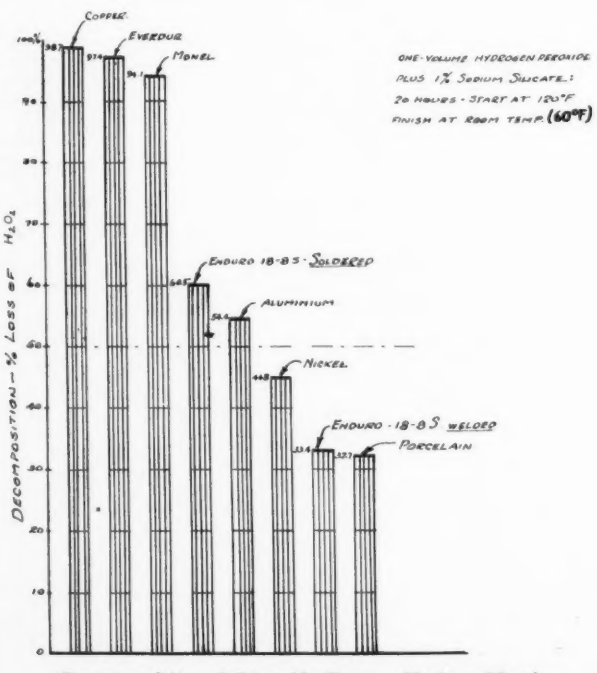
This study has been limited to the effect upon a one-volume hydrogen peroxide solution, made alkaline with sodium silicate (pH approximately 10.0), when metals commonly used in the textile industry are placed in contact with it. The methods employed have varied from an approximation of plant usage to a carefully controlled laboratory experiment. The problem being not only to evaluate the general effect of each metal, but also the effect of definite areas of metal to volume of solution; conclusions can be given as to the relative merit of each metal and the tolerance limit.

While no attempt is made to explain the forces responsible for the accelerated decomposition of peroxide baths in contact with the various metals, the writer feels that the results obtained are of sufficient practical importance to warrant the attention of the fabricator, and the actual user of textile equipment.

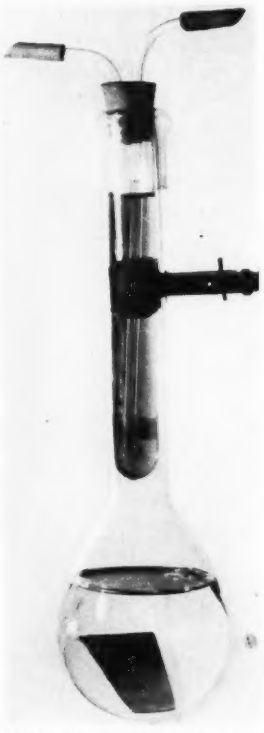
OVERNIGHT TESTS

A one-volume solution of hydrogen peroxide was made as follows:

The commercial 17 volume hydrogen peroxide was analyzed and the required quantity of peroxide added to a liter flask. Distilled water was added and then 5 ml. sodium silicate was pipetted into the flask. The whole was made to one liter with distilled water. Aliquots were taken and titrated with N/10 $KMnO_4$ to determine the total hydrogen peroxide content.



Decomposition of Peroxide Due to Various Metals



Kjeldahl Flask with Test Tube Condenser Showing Metal Under Treatment

From the stock solution of one-volume alkaline peroxide, 200 ml. portions were placed in clean porcelain dye pots and sleeves of the various metals added. These sleeves had been "pickled" with strong sulfuric acid, washed well with distilled water and dried. The pots were then heated to 120° F. and allowed to stand overnight, cooling by normal radiation to room temperature. After 20 hours, samples were taken from each and titrated to determine the peroxide content. One pot was run as a blank.

The determination of peroxide was as follows:

10 ml. of the one-volume solution was pipetted into 400 ml. of distilled water in a 600 ml. beaker. 20 ml. of 1:4 sulfuric acid was added and the whole titrated with N/10 $KMnO_4$ to a permanent pink end-point. One ml. N/10 $KMnO_4$ equals 0.001701 gm. hydrogen peroxide.

The metals used where those most likely to be found in plant practice: Nickel, aluminum, copper, Everdur, Monel, Enduro Stainless Steel, 18-8S (one soldered with silver solder and the other welded). The exposed area was approximately 34 sq. in. per 200 ml. of solution.

TABLE I

Sample	*H_2O_2 Solution*	*Loss of H_2O_2—%*
Original	0.303%	—
Blank	0.204	32.7%
Copper	0.004	98.7
Everdur	0.008	97.4
Monel	0.018	94.1
Aluminum	0.138	54.4
Nickel	0.167	44.8
Enduro 18-8S	0.202	33.4
Enduro 18-8S (Soldered)	0.111	60.5

The above table is the average of three runs. Due to the fact that a peroxide solution does not decompose at a regular rate and also that the same stock materials made into one-volume solutions and run identically did not give the same degree of decomposition on different days, the table had to be adjusted. That is, each run was comparable in itself but since the degree of decomposition of each run varied, they had to be adjusted for average compari-

son. The ratio of metal to volume of solution was roughly one square centimeter per ml. of solution. This is a very stringent test.

It was noted that Enduro 18-8S that was soldered with silver solder, gave results that varied widely from that obtained with the welded sample. The obvious fact was, that the solder accelerated the decomposition of the bath. When new and with a brassy appearance, the decomposition was greater than when the sleeve was used in a second run. However, prolonged exposure in a peroxide bath, or repeated use caused failure at the seam, due to the corrosion of the solder. The fact that copper was present in the solder and also that in practice copper or brass pipes and accessories are sometimes used in conjunction with other metals in textile machines, led to the study of the quantitative effect of copper in peroxide baths.

EFFECT OF COPPER ON H_2O_2 SOLUTIONS

Enduro 18-8S beakers were used for this test. 200 ml. of one-volume alkaline peroxide solution were used as before. However, the area of the stainless steel in contact with the solution was ascertained and then pieces of pure copper were cut and placed in the beakers, so that the areas of the copper and the stainless steel bore a definite ratio. The baths were heated as before to 120° F. and allowed to cool overnight.

TABLE II

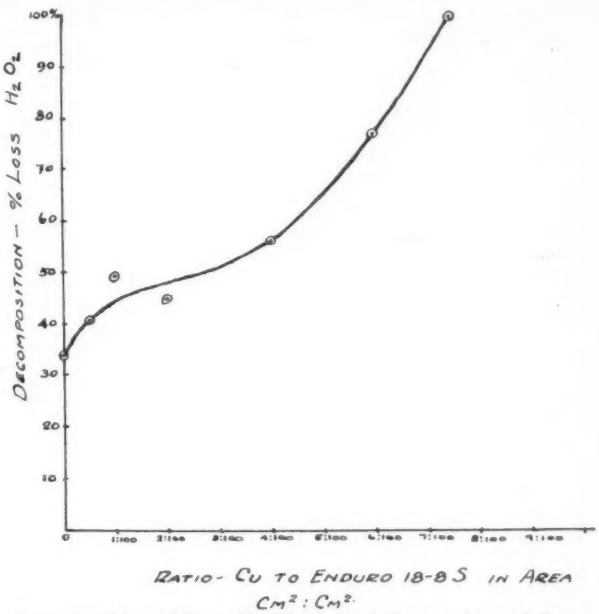
Ratio Cu to Enduro 18-8S	*% H_2O_2 Present*	*% H_2O_2 Loss*
Original	0.307	...
Blank	0.251	18.2
0.5 : 100	0.237	22.8
1.0 : 100	0.224	27.0
2.0 : 100	0.230	25.1
4.0 : 100	0.211	31.3
6.0 : 100	0.176	42.7
8.0 : 100	0.136	55.8

If this run were adjusted on the same basis as the other, then the table would be:

TABLE IIa

Ratio Cu to Enduro	*% H_2O_2 Left*	*% H_2O_2 Loss*
Blank—Original	0.307	...
Blank	0.205	33.4
0.5 : 100	0.180	41.3
1.0 : 100	0.156	49.0
2.0 : 100	0.167	45.6
4.0 : 100	0.136	56.8
6.0 : 100	0.071	77.0
8.0 : 100	0.000	100.0

To be absolutely fair in the consideration of the above data, one could only say that copper could be used in peroxide bleach baths where the ratio of copper to metal of the bath was 4.0 : 100 or less. Since the reaction of



Decomposition of Peroxide Bleach Bath Due to Area of Copper Exposed

Enduro 18-8S in peroxide baths is almost nothing, the resulting decomposition of the bath can be considered due to copper alone. If, therefore, these ratios were calculated to be the area of copper to volume of solution—to be in line with the work discussed below—it will be seen that the presence of copper is very destructive.

TABLE IIb

Ratio Copper to Solution Square cm. : 100 ml.	*% H_2O_2 Loss*
Blank	33.4
0.4 : 100	41.3
0.8 : 100	49.0
1.6 : 100	45.6
3.13 : 100	56.8
4.7 : 100	77.0
6.26 : 100	100.0

CONSTANT TEMPERATURE TESTS

Since, in the foregoing tests, there was a possibility of error that might affect the results due to the different cooling rates of the several runs, it was decided to make further tests at constant temperature for an exact length of time. Five hours at 120° F. was decided upon.

The method of running these tests was the same as above. Into 250 ml. Pyrex beakers were placed 200 ml. of the stock one-volume hydrogen peroxide solution and the piece of metal. A blank was run concurrently without any metal. In every case, stainless steel was run in the same manner as the metals under test. Loss of volume due to evaporation was made up with distilled water. The temperature was controlled within one degree F. All metals were "pickled" with strong sulfuric acid, washed

well with distilled water and dried before using. In the case of nickel, aqua regia was also used, followed by sulfuric acid. Both nickel and aluminium were rubbed with emery cloth to remove any oxide coating before pickling.

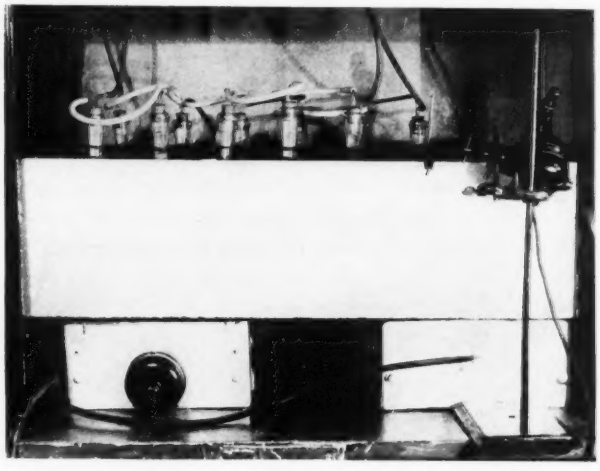
The results of these tests are included in the following table:

TABLE III

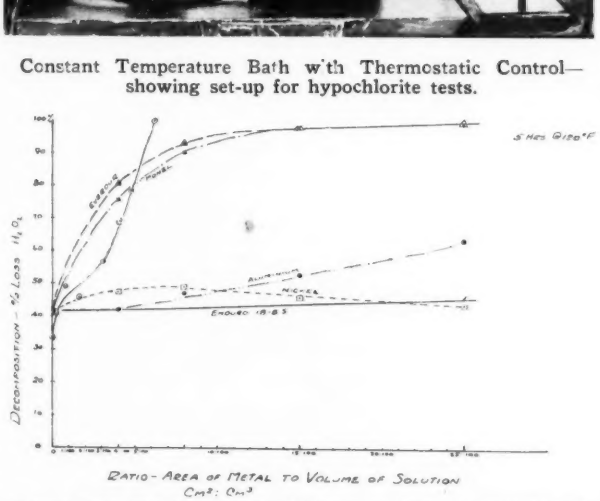
Sample	*% Peroxide Present*	*% Peroxide Loss*
Original	0.299	...
Blank	0.169	43.5
Enduro 18-8S—25 : 100	0.162	45.8
Monel Metal		
25 : 100	0.002	99.3
15 : 100	0.005	98.5
8 : 100	0.028	90.5
4 : 100	0.071	75.8
Everdur		
25 : 100	0.002	99.3
15 : 100	0.005	98.5
8 : 100	0.021	92.8
4 : 100	0.055	81.3
Nickel		
25 : 100	0.164	44.6
15 : 100	0.152	45.8
8 : 100	0.150	49.7
4 : 100	0.158	47.0
Aluminium		
25 : 100	0.109	63.5
15 : 100	0.140	53.3
8 : 100	0.158	47.0
4 : 100	0.172	42.6

The table shows definitely that any metal that has copper or any of its alloys in it, increase the rate of decomposition of peroxide solutions. Nickel and aluminium both gave trouble. No accurate result was reached due to the fact that nickel goes passive in the bath. As has been pointed out before, nickel readily oxidizes and in time forms a coat that is relatively impervious. This condition has been described as "passive." Although in the runs at room temperatures over-night, nickel proved to decompose the bath more rapidly than when maintained at a constant temperature of 120° F. for five hours. Further work on nickel to accurately determine the effect of peroxide solutions at various temperatures is necessary. It would be in line with the theory of passivity to assume that elevated temperatures will more readily form the protective coat of oxide, thereby preventing the reaction between the metal and the solution. Since the decomposition is a phenomena in which time is a factor, the sooner and more perfectly this coating is formed, the less will be the reactivity.

Another observation was that while Enduro does not "wet," a characteristic of chromium compounds or rather alloys, nickel does. The result is that bubbles of molecular oxygen form on the surface of the nickel and protect it, whereas the Enduro is free from bubbles. This should



Constant Temperature Bath with Thermostatic Control—showing set-up for hypochlorite tests.



Quantitative Result—Effect of Metals on Peroxide Bleach Bath.

be investigated to find the surface tension at the interface of the metal and solution.

Aluminium also gave some trouble. The alkaline solution forms a protective skin over the metal and also prevents the interaction of the metal and solution. In the cold the same thing obtains as in the case of nickel. But, since aluminium is slowly attacked by alkalies, there must be a definite corrosion of the metal. This was not measured.

EFFECT OF WOOL

It has been stated that wool seems to have a stabilizing effect on peroxide bleaching baths. This was investigated. Twenty gms. of wool were placed in 200 mls. of one-volume alkaline hydrogen peroxide solution and run at 120° F. for five hours. The bath was analyzed for oxygen content before and after the run. A blank was run concurrently.

Since the oxygen content is determined by $KMnO_4$ and any organic matter oxidizable, would also use up the permanganate, the result obtained might be in error. In other words, one would be calculating the organic matter so oxidized as oxygen. Therefore, another method was

used to determine the oxygen present. Both methods were used.

Into a 500 ml. Erlenmeyer flask, weigh 2-3 gms. of KI and dissolve in water. Then add 200 ml. distilled water and 30 ml. 1 : 2 sulfuric acid. Slowly add with constant stirring, 10 ml. of the peroxide solution and let the flask stand one-half hour. Titrate with N/10 sodium thiosulfate until the brown color is a very light straw and then add 1 ml. of starch solution and titrate carefully until the blue color is dispelled for at least 1 minute. One ml. thio. equals 0.0017 gm. hydrogen peroxide.

On the blank these two methods were used and both checked the other exactly. The iodometric method will titrate the oxygen only, any organic matter is not affected.

The following table gives the data obtained:

TABLE IV

Sample	*% Loss H_2O_2-$KMnO_4$*	*% Loss H_2O_2-thio.*
Original	...	...
Blank	33.8	33.8
Wool No. 1.....	24.4	25.4
Wool No. 2.....	28.4	28.4

From the above one could say that wool seems to have a stabilizing effect on a bleach bath. The amount is very small. Wool does not accelerate the decomposition of the solution. The cause for this may be many factors. However, it seems logical to suppose that the wool enters into chemical reaction with the alkali, thereby reducing the pH of the bath. This in turn causes the solution to become more stable.

CONCLUSION

The following conclusions can be derived from the data:

1. Assuming that 50 per cent decomposition is the average for plant practice, the most economical metals are for hydrogen peroxide bleach baths; nickel, aluminium and Enduro 18-8S.

2. Of the above metals, taking ratio of area to volume into consideration and also the time and temperature of the bleaching, nickel and Enduro 18-8S are the most practical.

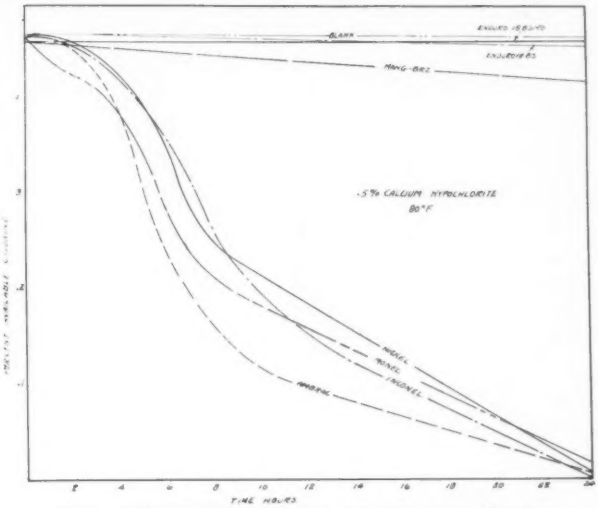
3. Other factors such as corrosion, contamination of the bath with undesirable salts or precipitates or mechanical fitness of the metals are not taken into consideration.

4. Stainless steel, soldered with silver solder, varies in its effect upon the peroxide bath. However, the data shows that it is not desirable to use soldered containers for peroxide bleaching.

5. Wool has a slight stabilizing effect upon alkaline peroxide bleaching solutions.

6. The following are the tolerance limits (ratio at which decomposition occurs) of area-volume ratios for various metals:

Copper—3 sq. cm. per 100 ml.
Everdur—less than 4 : 100
Monel—less than 4 : 100
Aluminium—8 : 100



Rate of Decomposition of a 0.5 Per Cent Calcium Hypochlorite in Contact with Various Metals.

7. Enduro 18-8S is almost as inert as porcelain or glass, to peroxide bleaching solutions.

CALCIUM HYPOCHLORITE
"HTH."—Mathieson Alkali Wks.

Analysis:			
	$CaOCl_2$	- -	75.64%
	$CaClO_3$	- -	1.25
	$Ca(OH)_2$	- -	4.65
	$CaCl_2$	- -	1.31
	NaCl	- -	15.67
Water by Difference		- -	1.48

Not less than 70 per cent available Chlorine

.5% Solution—23 Gr. $CaOCl_2$—3700 cc. Distilled Water

Samples—¾" x 2½—3.75 Sq. In. Surface

Solution—250 cc. in each flask.

One sample of each metal was completely immersed in 250 cc. of solution and held at 80° F. for a period of one to twenty-four (24) hours. Titrations were made each hour for available chlorine and each sample was weighted and examined for corrosive effect of solution on metal. Each flask was equipped with condenser to eliminate error due to evaporation.

In each case the liquor was alkaline; however, pH determinations were not made.

With the exception of manganese bronze, all corrosion occurred as pitting. The two outstanding facts developing from the above test are the high resistance of both Enduro 18-8S and Enduro 18-8S Mo to the corrosive effect of the liquor and the absence of any effect on the rate of decomposition of these solutions.

.5% Sodium Hypochlorite—80° F.

24 Gr. $CaOCl_2$ plus 24 Gr. Na_2CO_3 in 3700 cc. H_2O.

Same procedure as on $CaOCl_2$ solutions.

Titration—Standard—Sodium Thiosulfate Determinations.

20 cc. solution—dilute with 100 cc. H_2O.

10 cc.—10 per cent KI Solution.

10 cc.—50 per cent Acetic Acid Solution.

Titrated N/10 Sodium Thiosulfate—near end point added 1 cc. of starch solution and then completed titration.

1000 cc. Thiosulfate—3.55 Gr. Chlorine per liter.

Percent available Chlorine—from Titrations.

$$\frac{\text{cc. Sodium Thiosulfite} \times .00355 \times 100}{20} = \text{cc. Sodium Thiosulfate} \times .01775$$

.5% $CaOCl_2$—80° F.

Hr.	*Blank* %	*18-8S Mo.* %	*18-8S* %	*Monel* %	*Inconel* %
0	.469	.460	.470	.467	.463
1	.469	.461	.469	.432	.461
2	.469	.465	.471	.421	.460
3	.469	.462	.473	.421	.455
4	.469	.462	.469	.398	.352
5	.471	.461	.471	.342	.400
6	.469	.461	.470	.288	.321
7	.469	.460	.469	.216	.251
8	.469	.462	.470	.212	.213
23		.462	.469	.0409	.014
24	.467	.462	.455	.0213	.0017

Hr.	*Ambrac* %	*Nickel* %	*Manganese Bronze* %
0	.450	.470	.460
1	.451	.469	.451
2	.452	.460	.453
3	.440	.449	.455
4	.372	.446	.460
5	.294	.430	.455
6	.363	.425	.456
7	.108	.270	.451
8	.129	.246	.453
23	.0124	.032	.425
24	.00875	.0106	.432

Note stability of bath in Manganese Bronze.

.5% NaOCl—80° F.

Hr.	*Blank* %	*18-8S Mo.* %	*18-8S* %	*Monel* %	*Inconel* %
0	.472	.482	.462	.479	.472
1	.473	.473	.465	.481	.469
2	.471	.481	.469	.479	.468
3	.473	.480	.471	.479	.472
4	.473	.480	.471	.463	.472
5	.471	.485	.472	.468	.472
6	.473	.482	.465	.458	.469
7	.471	.481	.467	.444	.452
8	.473	.484	.470	.390	.469
23	.472	.480	.471	.210	.424
24	.473	.481	.471	.193	.394

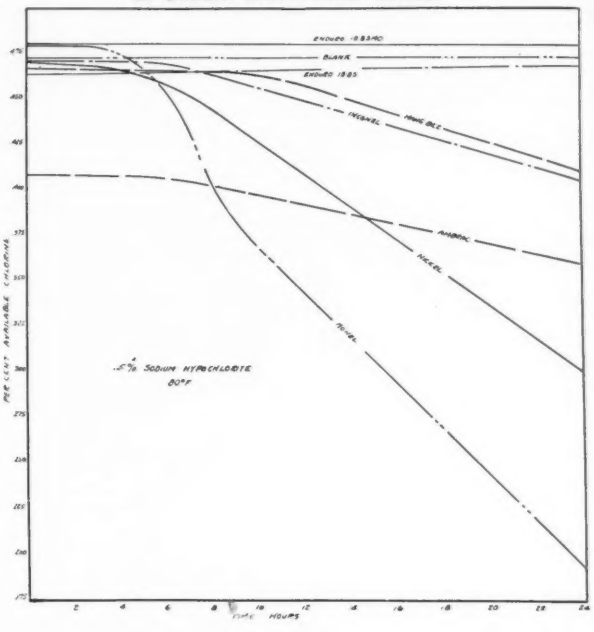
Hr.	*Nickel* %	*Ambrac* %	*Manganese Bronze* %
0	.471	.407	.465
1	.472	.406	.470
2	.468	.409	.470
3	.469	.407	.470
4	.458	.407	.470
5	.462	.407	.470
6	.457	.407	.470
7	.450	.402	.467
8	.449	.406	.465
23	.305	.368	.410
24	.300	.354	.413

Calcium Hypochlorite .5%

Weight Losses

Enduro 18-8S Mo. *Hr.*	*Loss in Gr.*	*Enduro 18-8S* *Hr.*	*Loss in Gr.*
1	.000 G.	1	.000 G.
2	.000	2	.000 G.
3	.000	3	.000 G.
4	.000 G.	4	.000 G.
5	.000	5	.000 G.
6	.000 G.	6	.000 G.
7	.000 G.	7	.000
8	.000	8	.000 G.
23	.000 G.	23	.000
24	.000	24	.000

Rate of Decomposition of a 0.5 Per Cent Sodium Hypochlorite in Contact with Various Metals.



Nickel *Hr.*	*Loss in Gr.*	*Inconel* *Hr.*	*Loss in Gr.*
1	.000	1	.000
2	.001	2	.001
3	.011	3	.001
4	.005	4	.009
5	.008	5	.006
6	.010	6	.009
7	.047	7	.007
8	.056	8	.011
23	.082	23	.039
24	.087	24	.021

Monel *Hr.*	*Loss in Gr.*	*Manganese Bronze* *Hr.*	*Loss in Gr.*	*Ambrac* *Hr.*	*Loss in Gr.*
1	.016	1	.002	1	.002
2	.016	2	.000	2	.001
3	.013	3	.002	3	.009
4	.018	4	.004	4	.030
5	.084	5	.004	5	.044
6	.035	6	.007	6	.015
7	.042	7	.012	7	.059
8	.055	8	.010	8	.067
23	.080	23	.041	23	.123
24	.082	24	.041	24	.118

Sodium Hypochlorite .5%

Weight Losses

Enduro 18-8S Mo. *Hr.*	*Loss in Gr.*	*Enduro 18-8S* *Hr.*	*Loss in Gr.*
1	.000	1	.000
2	.000	2	.000
3	.000	3	.000
4	.000	4	.000
5	.001	5	.000
6	.000	6	.000
7	.000	7	.000
8	.002	8	.000
23	.000	23	.000
24	.000	24	.000

Nickel		*Inconel*	
Hr.	*Loss in Gr.*	*Hr.*	*Loss in Gr.*
1	.001	1	.001
2	.001	2	.002
3	.001	3	.000
4	.004	4	.000
5	.003	5	.000
6	.003	6	.001
7	.003	7	.001
8	.004	8	.006
23	.062	23	.006
24	.023	24	.005

Monel		*Manganese Bronze*		*Ambrac*	
Hr.	*Loss in Gr.*	*Hr.*	*Loss in Gr.*	*Hr.*	*Loss in Gr.*
1	.000	1	.002	1	.000
2	.003	2	.000	2	.000
3	.000	3	.000	3	.000
4	.005	4	.003	4	.000
5	.002	5	.001	5	.000
6	.006	6	.002	6	.001
7	.008	7	.001	7	.001
8	.021	8	.000	8	.000
23	.042	23	.003	23	.001
24	.032	24	.002	24	.006

Analysis purchased as commercial manganese bronze sheet.

Stainless Alloys

Enduro 18-8S C. .059 Mn .55 Cr. 17.68 Ni 9.15 Mo. .005

Enduro 18-8S Mo. C. .060 Mn 1.30 Cr. 17.33 Ni 10.77 Mo. 2.30

MEETING, PHILADELPHIA SECTION

THE third of the 1936-1937 season meetings of the Philadelphia Section was held on Friday, January fifteenth, at the Penn Athletic Club in Philadelphia.

After the usual informal dinner, the Chairman, Mr. Travis, opened the business meeting by directing attention to the fact that the Annual Convention will be held in Philadelphia and announced that at the request of the Sectional Committee, Mr. R. M. Ritter, our Councilor, would act as general director of arrangements. Mr. Ritter started activities by the appointment of a Publicity Committee.

Following the usual routine business, Mr. Alban Eavenson of the Eavenson & Levering Co., Vice-President, and Chairman of the Sub-Committee on the Chemistry of Wool Fiber of the A.A.T.C.C., presented an informal address entitled "Some Thoughts on Wool". This talk was followed by one on the subject of "Fiberglass, Textiles, Insulation, etc." presented by Mr. J. L. Tucker, of the Industrial & Structural Products Division, of the Owens-Illinois Glass Co.

Mr. Eavenson directed attention to charts and publications to supplement his remarks and Mr. Tucker presented an elaborate exhibition of insulating materials, yarns, woven, knitted and braided fabrics entirely composed of glass, to illustrate his remarks.

Both talks with the discussions that followed, will be presented for publication in the REPORTER later.

Attendance 102.

Respectfully submitted by

CHARLES A. SEIBERT,
acting for the secretary.

MEETING, NORTHERN NEW ENGLAND SECTION

A MEETING of the Northern New England Section was held at the University Club, Boston, Mass., on Friday evening, January 8, 1937. About fifty-five members were present including two of our past chairmen, Mr. Roland Derby and Mr. Henry Grimes.

Dr. Carl Draves, Chairman, opened the meeting and announced that the annual meeting held in Providence was a marked success with a registration of 680 members. Dr. Draves then announced that the next annual meetings would be held in order in Philadelphia, Pa., Atlanta, Georgia and Boston, Mass.

Mr. Cox of the International Nickel Co. read a paper on "The Practical Usefulness of Nickel, Monel and Other Non-Ferrous Metals for Bleaching Purposes." Data was presented on the effect of both chlorine and peroxide bleach liquors on the metals. The paper was much enjoyed by those present and a rising vote of thanks was extended Mr. Cox at the completion of his paper.

Respectfully submitted,

JOHN N. DALTON, *Secretary.*

APPLICANTS FOR MEMBERSHIP

Active

A. Frank Bowles—Research Chemist, E. F. Houghton Co., Philadelphia, Pa.

Ernest Burrell—Dyer, Quality Dyeing Co., Philadelphia, Pa. Sponsors: J. W. Huber, M. M. Klotz.

Walter F. Fancourt, Jr.—President, W. F. Fancourt & Co., Inc., Philadelphia, Pa. Sponsors: R. M. Ritter, W. F. Fancourt 3rd.

Harry A. Gallagher—Dyer, Summerdale Dyeing & Finishing Works. Sponsors: A. E. Jones, Jr., W. A. Stringfellow.

H. J. Gambert—Chemist, Lanett Bleachery & Dye Works, West Point, Ga. Sponsors: L. L. Bamberger, W. F. Crayton.

Charles M. Howard—Superintendent, The Broad Brook Co., Broad Brook, Conn. Sponsors, T. G. Hawley, Jr., F. W. Sturtevant.

Robert V. Irwin—Southern Manager, International Salt Co., Charlotte, N. C. Sponsors: A. H. Gaede, T. R. Smith.

George C. Jones—Salesman and Demonstrator, International Salt Co., Charlotte, N. C. Sponsors: A. H. Gaede, T. R. Smith.

James A. Kidd—Salesman, du Pont Co., High Point, N. C. Sponsors: H. G. Miller, T. R. Smith.

James E. MacDougall—Southern Representative, Smith Drum & Co., Charlotte, N. C. Sponsors: R. D. Howerton, A. H. Gaede.

Thomas H. McKay—Supt. Dyeing and Processing, Threads Inc.. Gastonia, N. C. Sponsors: A. H. Gaede, T. R. Smith.

Abner Emery Mitchell—Supt. of Dyeing, Horner Bros. Woolen Mills, Eaton Rapids, Mich. Sponsors: A. E. Patton, F. B. Clemmons.

Karl T. Schaefer—Asst. Supt. of Textile Division, North American Rayon Corp., Elizabethton, Tenn. Sponsors: A. R. Thompson. Jr., S. L. Hayes.

Cyril Smith—Dyer, Gulbenkian Seamless Rug Co., New Brunswick, N. J.—Sponsors: Wm. Ebersold, J. H. Culver.

Harry A. Turley—Technical Superintendent, Pontiac Finishing Plant, Pontiac, R. I.

S. Weinberg—Director, Bureau of Standards, Gimbel Bros., Philadelphia. Sponsors: R. M. Ritter, D. H. Powers.

Fred E. Wilson—Salesman and Demonstrator, Geo. E. Sherman Co., Inc., High Point, N. C. Sponsors: H. G. Miller, T. R. Smith.

Harlowe R. Zinn—In Charge of Research, American Hair & Felt Co., Newark, N. J. Sponsors: F. G. LaPiana, D. E. Truax.

Junior

Frank B. Lutz—Chemist, Millville Mfg. Co., Millville, N. J. Sponsors: W. S. Hamlen, Jr., Israel Reiner.

James G. Lyerly—Dyeing Machine Operator, Wiscassett Mills Co., Albemarle, N. C. Sponsors: T. R. Smith, A. H. Gaede.

Emil W. Peters—Assistant Dyer, Adelphia Hosiery Dyers, Philadelphia, Pa. Sponsors: E. C. Bertolet, J. E. Goodavage.

S. Elmer Thompson—Laboratory Assistant, U. S. Finishing Co., Providence, R. I. Sponsors: W. H. Cady, R. A. Pingree.

William H. Wadsworth—Laboratory Assistant, Sandoz Chemical Works, Inc., Charlotte, N. C. Sponsors: T. R. Smith, A. H. Gaede.

Associate

Jack B. Button—Salesman, H. A. Metz, Charlotte, N. C. Sponsors: R. D. Howerton, A. H. Gaede.

John L. DeVries—Salesman, Oakite Products Inc., New York, N. Y.

David C. Holland—Salesman, Mechling Bros. Chemical Co., Camden, N. J. Sponsors: A. E. Jones, R. M. Ritter.

William P. Homans—Salesman, Atkinson, Haserick & Co., Boston, Mass. Sponsor: T. R. Smith.

Robert J. Quigg—Production Manager, Quaker City Chemical Co., Knoxville, Tenn.

R. J. Schadewald—Philadelphia Manager, American Aniline Products, Inc.

Gibbons G. Slaughter—Southern Representative, Atkinson, Haserick & Co., Charlotte, N. C. Sponsor: T. R. Smith.

Vernon A. Vaughn—Southern Representative, Victor Chemical Works, Greensboro, N. C. Sponsors: W. A. Wolhar, T. R. Smith.

Student

Fritz Kobayashi—Philadelphia Textile School. Sponsor: E. C. Bertolet.

James R. Taylor—Alabama Polytechnic Institute. Sponsor: A. R. Macormac.

CLOTH FOR CROCK METER

Squares of bleached white cotton cloth of the exact size and specification recommended in the 1935-36 Year Book for use with the Crock Meter are ready for distribution at the following prices:

Packages of 100.....$ .20 postpaid
3 packages ..... .50 postpaid
7 packages ..... 1.00 postpaid

(Smaller amounts may be paid for in United States postage stamps). They may be obtained from L. A. Olney, Lowell Textile Institute, Lowell, Massachusetts.

CALENDAR OF COMING EVENTS

Meeting, New York Section, Swiss Chalet, Rochelle Park. N. J., February 26, 1937.

* * *

Spring Meeting, Piedmont Section, King Cotton Hotel, Greensboro, No. Carolina, April 17, 1937. The Council will also meet there on the morning of the same day.

* * *

Meeting, Philadelphia Section, February 26, 1937, Penn. A.C., Philadelphia, Pa.

AMERICAN
DYESTUFF
REPORTER

LOUIS A. OLNEY, Sc.D.
Professor of Chemistry and Dyeing, Lowell Textile Institute
Directing Editor

A. P. HOWES
Publisher

NORMAN A. JOHNSON
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

Subscription price: $5.00 per year; Canadian $6.00, foreign, $6.00

Vol. 26 February 8, 1937 No. 3

MORE ON GETTING ALONG WITH PEOPLE—VI

Ed. Note:—This is the final installment of this series of editorials.

Giving and Getting Credit

THE question of credit for things accomplished is one of the most prolific of the causes of hard feelings. This is bound to be the case where personal advancement depends upon definite contributions to a company's success. However, when all is said and done, the manager of the mill, the department head, foreman, or chief chemist is bound to get credit for the successful things in the mill or in the department under him. It just naturally follows if there has been any outstanding accomplishment, and these people ought to be satisfied. However, a good many such people give the impression to others that they claim personal credit for everything that happens, without sharing it with those who actually made and worked out the suggestions.

First, do not mind too much if you are on the short end. Your purpose is to get things done. In many cases getting credit is but the "pleasure of the moment" although enough increments of credit may help you on your way.

Second, if it becomes important, figure out some way to get around it. It is more likely due to some peculiarity in the other person's character, or to thoughtlessness, than to conscious and deliberate piracy. Hence, try to use your head. It is perfectly possible for an individual to accept something about himself as a fact even though it actually is not. Since one can adopt a fantastic story into his realm of facts by unconscious processes well known to psychologists, it is not strange if a man in a mill who has some connection with a successful experiment or process-change may look upon the result as his own even though it actually is not. Having seen men who seem to claim credit for everything in sight I have been led to wonder whether they are really dishonest in the sense of robbing others of their proper share of whatever credit there may be. In many cases I believe that they are not intentionally unfair. Such a man may have helped bring something about entirely at another's suggestion but the whole thing is fixed automatically in his mind as his own accomplishment. Sometimes this state of affairs may be very unfair but an argument is likely not to amount to much.

The best move is to get your share in the result recognized higher up in some unobtrusive way—if it will do you any good.

If, however, it is mostly a matter of hurt feelings it is just as well to learn to put up with such things and not make any fuss until it really will amount to something. One who basks in borrowed glory may feel quite well satisfied with himself but he doesn't fool as many other people as he may suppose. Up to a certain point you have the laugh on him if you have the sense of humor that we mentioned before.

There are those who hate to admit that so much as a suggestion was received from anyone else, just as there are those who can't believe that *they* could possibly be wrong in anything.

There is also another angle to this credit business. People will work the hardest on their own ideas and be the most interested in them. Therefore, there may, at times, be a purpose in dropping hints to cause some one else to get an idea which you wish to see carried out. As an executive you may have to work some of these ideas from the other end, in this way. Start the thought working, let the other fellow develop it, and give him credit for it. Sometimes it is almost funny to see another come out with such a suggestion as his own but—the real idea is to get it done.

In your own work it is best to give credit for help and suggestions. It makes a better feeling all around.

It is more likely to make a bad than a good impression to run around claiming credit too promiscuously. Nor is it wise to claim too much in the presence of a superior, who may be of the credit-grabbing type. Do, however, most assuredly present the essentials of what you have done to the right people, and be fair enough to include others if they deserve it.

In Conclusion

It is still true that the simplest way to get along with other people is through their emotions rather than through reasoning, although it does not seem right and it probably should not be that way.

For correct and satisfactory decisions in business and technical matters reasoning should be the basis for action and we have tried to build up our case as far as possible on that basis.

Two of the most important things in a man's life are not based on reason. At least only rarely does it deter-

mine either his religion or his politics. Why, then, expect to find reason in the everyday smaller interests? That is, to a certain extent, you start with a handicap.

However, do not resort to trickery and try to put something over. Your victim will feel tricked even though the result may have been good, and he will be suspicious of your next project. If your idea won't stand the light of day it is better to try to learn enough about it so that it will, and then present it in a proper manner.

Let the people who are doing things for you have their own way as far as possible if they have real ideas and if the desired result will be produced. Who cares just how a piece of machinery or apparatus is made if it does just what it is supposed to do, and is made at minimum cost? Let the mechanic, or the mill operator do things in his own way if he convinces you that it will work. He may have better ideas than yours.

Always remember that it is as important to avoid making a bad impression as it is to make a good one.

There are other methods or strategies which have not been discussed here, especially the more personal or emotional kinds. In explanation of any apparent omission, we have included for the most part only personal experiences or observations, supported by supplementary reading and have not included much that has not been studied at first hand or actually practiced.

Many of these things of which we may have talked rather glibly are in reality difficult. Some of the things may seem rather small but much trouble can come from even smaller things than these.

WASHINGTON NEWS LETTER

(Continued from page 58)

following legend conspicuously displayed thereon: "Caution—This product contains ingredients which may cause skin irritation on certain individuals and a preliminary test according to accompanying directions should first be made. This product must not be used for dyeing the eyelashes or eyebrows".

In extension of the existing machinery of color certification, Section 23 of the new Bill authorizes the Secretary of Agriculture to promulgate regulations for the certification of coal-tar colors which are harmless and suitable for use in cosmetics, and for coal-tar colors used in hair dyes as provided in Section 20, above quoted.

Former regulatory policy is continued in the Food sections of the revised Bill. Thus it is redeclared that a food shall be deemed to be adulterated if it contains a coal-tar color other than one from a batch that has been certified. Included in the specifications covering misbranding of foods is the denunciation of any artificial color (not prohibited under the adulteration ban) where the label fails to give due notice of the presence of the allowable color. This latest Food, Drug and Cosmetic Bill is shorter and less verbose than its predecessors which failed of passage. The Bill makes a wholly new approach to the controversial subject of control of advertising. And, even here, there is possible remote contact with color interests. Because prohibition by injunction, which is the remedy provided for faulty advertising, is to cover any design or device regarding a food, drug or cosmetic which is false or misleading in any particular. Seemingly all color advertising may be open to indictment on the score of accuracy.

TEXTILE TESTING AT THE GOVERNMENT PRINTING OFFICE

Evidencing, in the beginning, textile interest restricted to bookbinding materials, etc., there has been steady expansion of the activities of the Division of Tests and Technical Control of the U. S. Government Printing Office. Last year this laboratory tested 914 textile samples, a considerable increase over the previous year. Color research at this institution has, latterly, been most extensive in the case of inks. At the request of the Ordnance Department of the U. S. Army the technicians have developed red, orange, green and blue machine-gun, target-making inks for use in spotting bullets to record accuracy in firing. Cloth targets are color-marked by the penetration of the color-carrying bullets. Although the long-awaited Commercial Standard for Book Cloths became a reality this past year, and has been approved by the American Standards Association, the Division of Tests and Technical Control will continue its investigative work on book cloths and impregnated fabrics. Progress has been made at the laboratory the past year in the continuing research relative to color as a property of paper affecting its printing quality. The color quality within several classes and grades of paper has been unified and improved by changing standards of color—especially by the introduction of new standards for whiteness.

HOSIERY DYE INVESTIGATION IS FEATURED

Officials of the National Bureau of Standards have selected their current research program in grading the color of raw silk as an example for Congress of the constructive work of the Bureau. In this project to certify enamel standards designated as white, ivory and cream in a form satisfactory for use in grading the color of raw silk the Bureau has worked in cooperation with the National Association of Hosiery Manufacturers.

The Bureau program proceeded on the assumption that to dye hosiery successfully it is essential to segregate the raw silk into three classes, each class being accorded a different treatment. Using color as the gauge in assortment it has been proven possible to reduce two-tone rejections to less than 10 per cent.

Specifically, the task before the Bureau has been the measurement of the master color standards and expression in a fundamental colorimetric coordinate system. The problem was complicated by the circumstance that color differences between the master standards are minute,—notably as between raw-silk ivory and raw-silk cream. Yet these distinctions are important. Hence the precaution to provide in the master standards a carefully-controlled gloss, imitative of the high lights of lustrous skeins and permitting accurate color comparisons.

Several instruments that will remain as permanent assets were designed and developed by the Bureau expressly for this project. One addition was the special colorimeter constructed to allow for the cylindrical shape of the standards and to attain the high-precision colorimetry required. Its complement is the Bureau—designed photo-electric reflectometer. As the outcome of this undertaking there have been made available specifications for master standards for raw-silk white, ivory and cream sufficiently exact to enable the making of satisfactory duplicates should the originals be lost or destroyed. Checked against more than one hundred samples the new found method of expressing tolerances is finding ready acceptance. The net gains will probably ultimately be translated to all color-determinative spheres. Most versatilely, no doubt, via the new inventions in apparatus, such as the items above mentioned and the gloss-inspection lamp which renders possible the determination of gloss in the master standards on an arbitrary scale.

FINAL CHAPTER OF A FAST DYE INVESTIGATION

The Bureau of Chemistry of the U. S. Department of Agriculture rounded out a period with the climax of its investigations bearing on the production of fast dyes for agricultural fibers. The final chapter was a study of conditions affecting the conversion of halogenous compounds into amines by ammonolysis. Bureau specialists declare that their findings indicate that it is advantageous to use a higher ammonia concentration than is customary in this synthesis and that cupric as well as cuprous compounds may be used as catalysts. The study derives its prospective extensive contacts from the assumption that it has afforded a better understanding of the fundamental factors involved in amination by ammonolysis—a factor in the synthesis of anthra-quinone compounds essential as intermediates for certain fast dyes.

Bureau specialists have lately made fresh discoveries evidenced in two public-service patents relating to the production of dye intermediates. Carried on, in directions previously indicated, is the work on the chemical and spectrophotometric examination of dyes and on the synthesis of biological stains and dyes of antiseptic or therapeutic value. Commercially valuable is the new process evolved for purifying magentas for therapeutic uses. Not only may the method be readily incorporated as a regular step in the ordinary routine of manufacture but its efficacy has been proven by the fact that many previously rejected commercial samples were shown to be usable when subjected to the new procedure. The quest for better methods of mildew-proofing cotton fabrics for outdoor use on farms is a standing order at the Bureau of Chemistry. This past year activity has focused on the effort to determine whether the precipitation of chromium or copper compounds, or both, on canvas in water-insoluble form is essential to impart mildew resistance to mineral-dyed khaki canvas.

In an organization shake-up at the Chemistry Bureau, the former Color and Farm Waste Division was abolished and its activities were merged with the remaining activities of the Industrial Farm Products Division, the name of which has been changed to the Industrial Farm Products Research Division. Chemical Engineering Research retains its Divisional set-up.

TECHNICAL NOTES FROM FOREIGN SOURCES

Decomposition of Hydrogen Peroxide in Alkaline Solution, and Its Importance in the Bleaching of Cotton

Dr. C. Doerfelt—Monats. f. Textil-Ind. 50, 90 (1935). —The introductory part of this paper has already been noted.

The present section covers the results of much experimental work, and includes ten graphs and one diagrammatic illustration of the apparatus used in the bleaching experiments, in which the amount of oxygen liberated was measured.

In this section, the author concludes that water-glass is superior to sodium pyrophosphate as a stabilizer of alkaline peroxide solutions, on the ground that the former is able to depress the concentration of the hydroxyl ion more strongly; he also observes that, with a low concentration of caustic, the bleaching power of the peroxide decreases as the amount of water-glass increases, but that, at higher concentrations of caustic, with the same relations, an increase of the bleaching power of the total peroxide takes place (more and more of the peroxide present is available for bleaching).

The concluding section of the paper (l.c. p. 117) deals principally with studies of the course of action of sodium pyrophosphate as stabilizer (six graphs). He concludes, inter alia, that water-glass is the best stabilizer of any examined, and that the amount of free alkali present must not be too small; also pointing out that there is an optimum concentration of caustic.

The author does not, however, consider his work as finally conclusive, except in so far as methods at present used are concerned.

Synthetic Detergents

Fritz Ohl — Monats. f. Seide u. Kunstseide 40, 178 (1935).—A thoughtful discussion of the place which the newer detergents, especially the fatty-alcohol sulfonates, have won for themselves: not a technical paper, but an appreciation. The author lays most stress upon the valuable power of some of the preparations to prevent the deposition of lime soaps upon the goods under treatment.

Adsorption of Dyestuffs upon Glass

J. Lenoir—TIBA 30, 855 (1935). — An interesting paper, from its nature, of course, of no practical bearing (as yet, at least), taking up the topic from the precise, scientific standpoint.

One possible application of the phenomenon of adsorption would be, the possibility of measuring the surface of an irregular glass mass, as, for example, that of a quantity of powdered glass to be used in the study of the behavior of gases and vapors. Since the dyestuff adsorbed has been shown to form a monomolecular layer with those dyestuffs which form a true solution, while those which form a colloidal solution deposit in a mono-micellular layer, subsequent colorimetric estimation of the solution would make it possible to calculate the area of the surface upon which the amount of dyestuff, determined in quantity, had been absorbed, and this in quite a simple manner.

CORRECTIONS

Re "The Measurement of the Color of Dyed Textiles"

THE following corrections should be noted in connection with the article entitled "The Measurement of the Color of Dyed Textiles" by Robert D. Nutting which appeared in the November 2, 1936 issue.

Equation 3, page 589, is incorrectly printed since inspection will show that $A\infty$ (not A^{∞}) will cancel out reducing it to a form identical with that of Equation 2. The correct form for Equation 3 (see the ordinate of Figure 8) is:

$$\log_{10}\left[-\log_{10}\left(\frac{1-A/A\infty}{1-Au/A\infty}\right)\right] = \log_{10}K + \log_{10}C$$

The left hand member of Equation 3 was also incorrectly printed, as above, on page 590.

The phrase on the right hand side of Figure 4 "Number of Swatches (Thickness)" should appear as the abscissa of Figure 5.

"A^{∞}" should be "$A\infty$" in several places and the abcissa of Figure 2 should read "Wavelength in Millimicrons" instead of "Wavelength in Millicrons".

TRADE NOTES — NEW PRODUCTS

• N. E. SELLING AGENTS

John O'Day, president, United States Dyestuff Corp., 140 Oliver St., Boston, Mass., announces the appointment of his company by the Fulton Dye & Import Co. as sole New England Selling agents for the various products (dyestuffs, chemicals, etc.) manufactured by the following French chemical companies: Etablissements Kuhlmann, Saint Denis Dyestuff & Chemical Co., Saint Clair-du-Rhone Dyestuff & Chemical Co., Mulhouse Dyestuff & Chemical Co.

• COLLOID MILL

The Laboratory Equipment Co., 146 Lafayette St., New York City, offers to the chemist and laboratory worker the new Gaulin Laboratory Colloid Mill. The following claims are made by the manufacturers: it is the only true laboratory colloid mill on the market at a low price; it prevents separation and creaming of certain emulsions; it gives smoother and smaller particle size emulsions; it often lowers costs for with it a smaller amount of emulsifying agent may sometimes be used; it will take samples as small as four ounces; its output on a free flowing emulsion is about 15 gallons an hour. Copies of a pamphlet describing the mill are available upon request.

• COLGATE PROMOTION

Martin M. Stuart, manager of the Glycerine Sales Department of the Colgate-Palmolive-Peet Company, has been appointed Manager of the Industrial Sales Department in addition to his present office, according to an announcement by S. Bayard Colgate, President of the Company. Mr. Stuart succeeds Arthur F. Danz who has joined Kirkman & Son as Vice President and General Manager.

Mr. Stuart was affiliated with the Peet Bros. Company as Assistant Sales Manager before its merger with the Palmolive Company in 1927. Since the merger of the Palmolive-Peet Company with the Colgate Company he has held several executive positions. He has been in the soap business for twenty-five years.

• NEW LABORATORY

At a cost of approximately $40,000 and a 50 per cent increase in its staff of graduate chemical engineers and metallurgists, Bausch & Lomb has opened a new laboratory for applied research.

"Believing that the optical industry in America will meet increasingly keen competition from abroad where low labor costs exist, Bausch & Lomb will engage in a broad program of fundamental investigations on the chemistry and physics of glass surfaces and in the development of new materials and processes for the industry," said Theodore B. Drescher, Vice President, under whose direction the new laboratory has been placed.

Guided by Frank P. Kolb, chief chemist, and Theodore J. Zak, assistant chemist, company officials saw the conversion of nearly 9,000 square feet of space on the fifth floors of two buildings facing the Genesee River into a series of laboratory units devoted to research in the fields of metallurgy, experimental electro-plating, spectroscopy, photomicrography, and physical testing. A well-stocked library and a consulting room add to the facilities of the research staff.

• STUDENTS TEXTILE EXHIBITION

Marshall Brandon Payne of Kannapolis has been elected superintendent of the Students Textile Exposition which will be held in connection with the North Carolina State College Style Show on Thursday, April 22. To be elected superintendent of the Students Textile Exposition is regarded as the highest honor which Textile students at State College can confer upon a member of the senior class. Mr. Payne is a son of M. M. Payne, assistant superintendent in charge of weaving at the Cannon Mills. He has had considerable practical mill experience and during the present school year is acting as a student assistant in the weaving department. He has established an excellent scholastic record at State College.

Other students elected as officials of the Students Textile Exposition were as follows:

Foreman of Yarn Manufacture, E. W. Blackwood of Swepsonville; Foreman of Knitting, C. E. Johnson of Liberty; Foreman of Weaving, N. M. Dalrymple of Jonesboro; Foreman of Dyeing, E. S. Horney of Greensboro; Foreman of Designing, J. A. Boland of Burlington; Assistant Foreman of Yarn Manufacture, C. J. Squires of Draper; Assistant Foreman of Knitting, R. E. Dixon of Winston-Salem; Assistant Foreman of Weaving, T. M. Tyner of Shelby; Assistant Foreman of Dyeing, J. E. Spainhour of North Wilkesboro; Assistant Foreman of Designing, B. H. Sigmon of Alexis.

• RESIGNS OFFICE

Dr. Foster Dee Snell resigned as Honorary Secretary of the American Section of the Society of Chemical Industry at the Perkin Medal meeting held at The Chemists' Club in January. Dr. Snell took over the duties of this office on March 20, 1925 and has ably performed those duties for over 10 years. He was secretary at the time when the Society visited this country in 1928 to hold its annual meeting. During the following year Dr. Arthur D. Little was president of the Society.

Mr. Cyril S. Kimball has been elected to succeed him in the office of Honorary Secretary of the American Section.

• S. O. C. I. MEETING

The Society of Chemical Industry, American Section, will hold a meeting on February 19, 1937, at 7:30 p.m. at The Chemists' Club, 52 East 41st Street, New York City. Mr. James G. Vail will preside over the meeting at which Dr. Wallace P. Cohoe is to be the guest speaker. His paper is entitled "Permanent Sizing with Alkali Soluble Cellulose Ethers." This is a subject of practical as well as scientific interest. A dinner will precede the meeting, starting at 6:00 p.m.

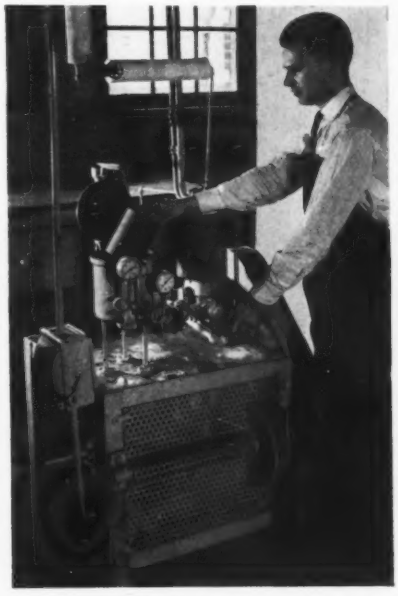
• DU PONT TECHNICAL LABORATORY

Shown below are a number of views of the technical laboratory of the du Pont Company at Deepwater, N. J. As explained in the news story which appeared in our issue of December 28th the technical laboratory is a service organization connected with the dyestuffs sales division and is devoted to the solution of the problems in dyeing and finishing which confront the textile mill operator. All of the commonly used methods of dyeing are employed at the laboratory—package machines, raw stock machines, jigs, padders and printing machines are used to test the application of dyes based upon actual mill conditions. Fastness and standardization tests are made to insure uniform quality. All photographs courtesy of du Pont Co.

Textile printing machine testing dyes for printing.

ABOVE: At left, a small experimental jig; in center, package machines.

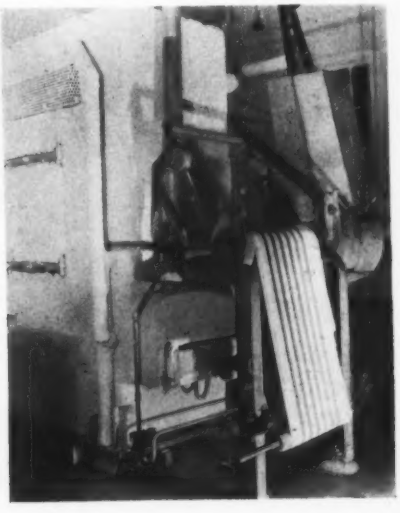
BELOW: Spectrophotometer used to measure the strength of a dye.



Package machine for dyeing a spool of yarn.

ABOVE: From right to left, two large and one small hydro-extractors, a raw stock machine, a six package machine, four one package machines.

BELOW: Textile printing ager.



• ODOR ADSORBERS

The Consolidated Air Conditioning Corp., 114 East 32nd St., New York City, announces publication of a booklet entitled "Consolidated Odor Adsorbers in Air Conditioning." The booklet is described by the publishers as follows: "This booklet covers quite completely the question of cost of operating an air conditioning system. The large savings which can be effected by the use of Consolidated Odor Adsorbers because of the reduction in the amount of fresh 'make-up' air are outlined. A set of tables showing these savings for various air volumes is included." Copies are available upon request.

• S.O.C.M.A. MEETING

The regular monthly luncheon-meeting of the Synthetic Organic Chemical Manufacturers Association of the U. S. was held at the Chemists' Club, New York, on Tuesday, January 12, 1937. The Chairman, August Merz, opened the meeting with a few words of appreciation of the testimonial tendered him at the Annual Meeting dinner on December 8, 1936. He also announced that the Stauffer Chemical Co. has been elected to active membership in the association. The secretary reported on current legislative developments. The next general-luncheon meeting will be held on Tuesday, February 9th.

• pH BOOKLET

"Measuring pH with the glass electrode" is the name of a new booklet published by the Coleman Electric Company, 316 Madison Street, Maywood, Illinois, manufacturers of the Coleman pH Electrometer. This booklet was written in conjunction with one of the first and most successful researchers in this field; covering a general discussion of the theory of the glass Electrode and factors that must be considered in its practical application. The following subject headings describe the nature of the text material covered:

(1) The significance of pH and various means of its measurement; (2) The theory of the Glass Electrode; (3) Description of the Sealed Glass Electrode; (4) Description of the Sealed Reference Electrode; (5) The importance of the Liquid Junction; (6) Compensation asymmetry and temperature errors; (7) Residual temperature errors; (8) The importance of buffer calibration; (9) The alkali error of Glass Electrodes; (10) The non-aqueous error of Glass Electrodes; (11) The solubility error of Glass Electrodes.

Acid, alkali and temperature correction tables are included, together with a very complete bibliography of some 130 references.

Copies of this booklet may be had by request on your business stationery to the Coleman Electric Company.

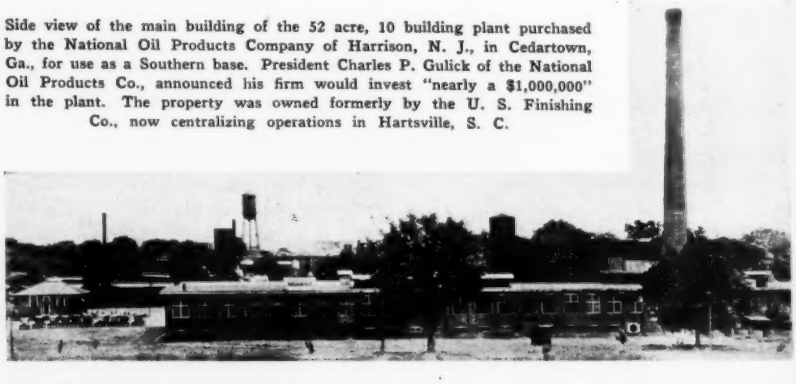
• NEW NOPCO PLANT

Charles P. Gulick, president, National Oil Products Co. of Harrison, N. J., announces the purchase of a new plant at Cedartown, Ga. to be used for the manufacture of products used in textile processing, paper milling, and other industries. The property, consisting of 52 acres and 10 buildings, was owned formerly by the U. S. Finishing Co. which has centralized operations in Hartsville, S. C. Construction will be started immediately on another building. This new site will be second in size only to the Harrison plant.

The plant will manufacture completely all type products of sulfonation, condensation, high and low temperature chemical reactions and compounds of complex chemical synthesis. A wholly owned subsidiary, the Metasap Chemical Co., will manufacture metallic soaps in one of the buildings. Research and control laboratories will be manned by local chemists who will operate in conjunction with the main laboratories in Harrison. Modern equipment will be installed in the new laboratories which will be at the disposal of industries desiring research work on their products.

It is expected that the new plant will be in operation in approximately three months. It will have its own sales force which will be responsible directly to the officials in charge of the Cedartown offices. These men will handle a complete line of specialized oil products for bleaching, dyeing and finishing.

CHARLES P. GULICK



Side view of the main building of the 52 acre, 10 building plant purchased by the National Oil Products Company of Harrison, N. J., in Cedartown, Ga., for use as a Southern base. President Charles P. Gulick of the National Oil Products Co., announced his firm would invest "nearly a $1,000,000" in the plant. The property was owned formerly by the U. S. Finishing Co., now centralizing operations in Hartsville, S. C.

CLASSIFIED

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

WANTED:—Nationally prominent refiner and manufacturer of fiber lubricants and emulsions for mohair, worsteds, wool, merino, rayon and carpet yarns has unusual opportunity for successful sales representative to cover state of Pennsylvania. Salary or commission basis. Write in detail training, experience, record of sales past five years, age, references, etc. Box No. 937, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

CHEMIST WANTED by Eastern Manufacturer with experience in the analysis and manufacture of Sulphonated products and compounds for textile processing. State salary expected. Write Box No. 940, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.